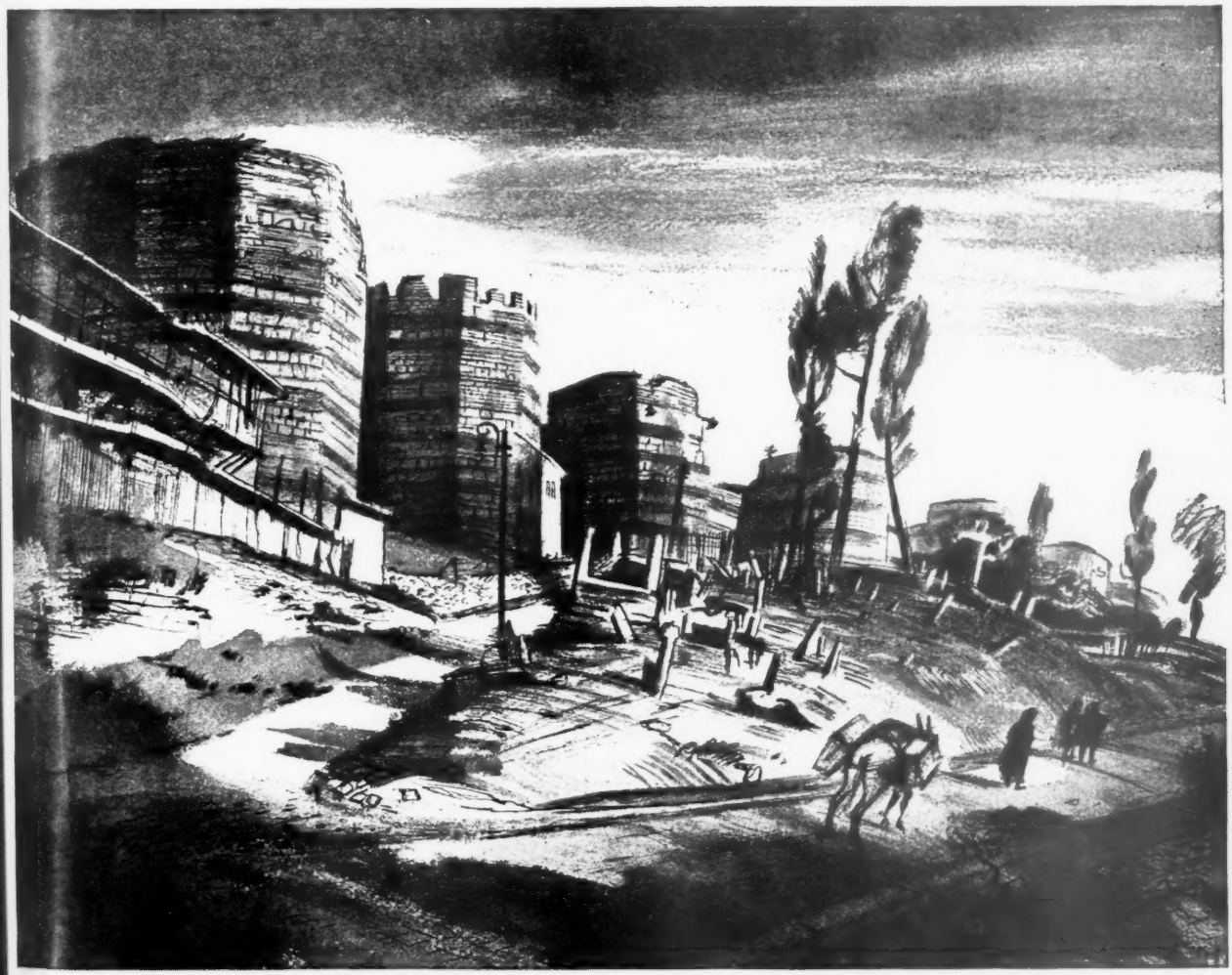
THIRD SERIES VOL 62 NUMBER 8 JUNE 1955

66 PORTLAND PLACE LONDON W1 . TWO SHILLINGS AND SIXPENCE



The Byzantine walls of Istanbul. From a drawing by Alan Sorrell

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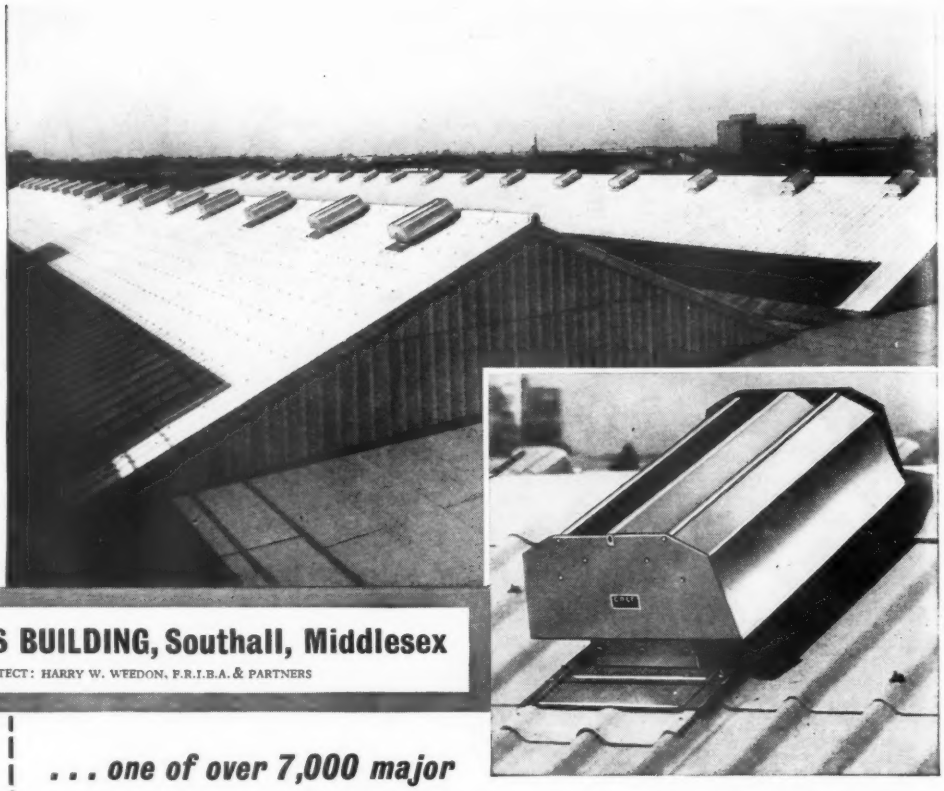

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THE JOURNAL OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

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JUNE 1955

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The Journal and the Railway Strike

While this JOURNAL was being prepared for the press the strike was continuing. In deciding on the number of pages we had to conform to the weight limit imposed by the Post Office; hence the slenderness of this issue. When the strike ended, printing was too far advanced for extra pages to be added.

Council of the Architectural Association, 1955–56

The result of the ballot for the election of the Officers and Council of The Architectural Association for the Session 1 June 1955 to 31 May 1956 is as follows: *President:* Bryan Westwood, A.A.Dipl. (Hons.) [*F*]. *Vice-Presidents:* Gontran Goulden, T.D. [*A*], and John Brandon-Jones, A.A.Dipl. [*A*]. *Hon. Secretary:* D. Clarke Hall, A.A.Dipl. [*F*]. *Hon. Treasurer:* Edward Playne, D.S.C., A.A.Dipl. [*F*]. *Hon. Editor:* J. M. Austin-Smith, M.C., T.D., A.A.Dipl. [*A*]. *Hon. Librarian:* Neville Conder, M.S.I.A., A.A.Dipl. (Hons.) [*A*]. *Ordinary Members of Council:* B. L. Adams, A.A.Dipl. (Hons.) [*A*]; H. T. Cadbury-Brown, A.A.Dipl. (Hons.) [*F*]; Oliver J. Cox, A.A.Dipl. (Hons.) [*A*]; John S. Lacey, A.M.T.P.I., A.A.Dipl. [*A*]; H. J. Whitfield Lewis [*A*]; Howard V. Lobb, C.B.E. [*F*]; Peter Newnham, M.C., A.A.Dipl. (Hons.) [*A*]; Miss Barbara Price, M.A. (Cantab.), A.A.Dipl. [*A*]; Graeme Shankland, M.A. (Cantab.), A.M.T.P.I., A.A.Dipl. [*A*]; Peter Shepheard, B.Arch. (L'pool), A.M.T.P.I., A.I.L.A. [*A*] (Past President); Prof. Basil Ward, Hon. A.R.C.A. [*F*].

Board of Building Education

The Institute of Builders are to establish a Board of Building Education to advise on methods and standards of technical education and practical training for executive, administrative and managerial positions in building. The move has been welcomed by the National Federation of Building Trades Employers who agree that there should be close collaboration on this matter between the two organisations with the aim of securing the general recognition of proper standards of training and qualification.

Initially the Council of the Institute of Builders will appoint 10 members and the Federation are to be invited to appoint 8 representatives. At an early date the Board may invite representation by professional, educational and operatives' interests. The Board will elect its own chairman. The Institute will appoint a secretary and staff.

The Board will issue reports and recommendations on specific matters from time to time and will submit annually a report to its component bodies through the Council of the Institute of Builders.

Building Industry Restrictive Practices

The text of Ministry of Housing and Local Government Circular No. 32/55, under the above title, is published in Practice Notes on page 343. Following the statement made by the Minister of Works in the House of Commons last December on this subject, copies of a letter have been sent to all contractors on Government lists, together with a form of reply, asking them to confirm that they wish their names to remain on the list and that they agree not to follow the practices of tender adjustment condemned by the Monopolies and Restrictive Practices Commission. The circular states that in future firms will not be included on any list of approved Government contractors for new buildings if in tendering for such work they follow these practices.

Chairmanship of The National Joint Council

At the annual meeting of the National Joint Council for the Building Industry on 27 April, Mr. Stephen Hudson, of Sunderland, was unanimously elected chairman of the Council in succession to Mr. W. H. Forsdike, C.B.E.

Mr. Hudson's election was proposed by Sir Richard Coppock, C.B.E., General Secretary of the N.F.B.T.O., and seconded by Mr. G. W. Buchanan, C.B.E., the senior employer member of the Council. Mr. H. Payne, J.P. (National Federation of Roofing Contractors), Mr. W. E. Fishburn, O.B.E., chairman of the National Conciliation Panel, Mr. M. L. Binley (National Federation of Plumbers and Domestic Engineers-Employers) and Mr. J. C. Hill (Amalgamated Society of Woodworkers) also supported the motion.

Warm tributes were paid by members to Mr. Forsdike's long record of distinguished service to the Council, he having been chairman since 1943. Mr. H. Weaver, President of the Amalgamated Union of Building Trades Workers, claimed that the National Joint Council had no superior in the industrial life of this country and Mr. Forsdike had guided it during the most difficult years of its history. He had occupied the chair with dignity, tolerance and understanding of both sides of the Council. Sir Richard Coppock spoke of his appreciation of Mr. Forsdike's patience, calmness, decisiveness and impartiality—the latter being the predominant factor during his chairmanship of the Council.

Mr. J. H. Mills, President of the National Federation of Building Trades Operatives, was unanimously re-elected Vice-Chairman of the Council and Sir Richard Coppock and Mr. I. Ernest Jones were unanimously re-elected joint secretaries.

H.R.H. The Duke of Edinburgh at the R.I.B.A.

H.R.H. The Duke of Edinburgh visited the R.I.B.A. building on 23 May as the guest of the Pharmaceutical Society of Great Britain to whom the Council had lent the building for a reception to commemorate the new constitution of the Society. The President, Mr. C. H. Aslin, C.B.E., and Mrs. Aslin and the Secretary, Mr. C. D. Spragg, C.B.E., were among the guests of the Society and were presented to His Royal Highness.

Dudok

W. M. Dudok, Royal Gold Medallist in 1935, has been awarded the Gold Medal of the American Institute of Architects. He is visiting the A.I.A. Convention at Minneapolis on 23 June to receive the medal from the President, Mr. Clair W. Ditchy.

Angelica at Kenwood

There is surely no lovelier place in London than Kenwood, set among the leafy wynds of Hampstead, and to its charms is now added the summer exhibition of Angelica Kauffmann paintings and engravings, which was opened on 27 May by Professor A. E. Richardson, F.S.A. [*F*], President of the Royal Academy. To wander round Robert Adam's building, looking alternately at Angelica's works and at the equally period piece view seen from the windows, of terrace, sloping lawns and lake, is a pleasure that should not be missed in London this summer.

The story of Angelica remains always an intriguing riddle, and constantly the tantalising question arises, why was she so renowned in her time? (It will be remembered that a review of Mrs. Adeline Hartcup's book on her appeared in the March JOURNAL.) So far the answer appears to be that she was so completely of her time. Her ladies from classical legend with their charmingly vacuous faces, flowing locks and draperies and habit of weeping becomingly over some departing hero were no doubt to contemporary taste, as also were the leisured ladies in their meticulously portrayed Turkish costumes (the eighteenth-century equivalent of the modern drain-pipe pants) busy at their embroidery. To our modern eyes the charm of her decorative work is almost purely nostalgic, but her portraits—the least remembered of her paintings—have undoubted character and liveliness. We reproduce one here, of Michael Novosielski, a Polish-born nobleman who studied architecture in Rome and practised for a time in London, rebuilding the Opera House in the Haymarket in 1789. (It was burnt down in 1867.)

The exhibition is on view until September, from 10 a.m. to 7 p.m., on Sundays from 2.30 p.m. It is reached by 210 bus from either Golders Green or Archway stations, both on the Northern Line.

Architects and Local Government

Alderman S. R. Miller [*F*] has been elected Mayor of the Borough of Harrow. Two other architect members of the Borough Council are Mr. E. S. W. Atherton [*F*] and Mr. F. Adkins [*A*].

The Annual Reception 1955

This year's Reception may be considered to have celebrated the coming-of-age of the R.I.B.A. building, because 21 years ago it was opened by King George V. The public rooms still form 'the best reception suite in London', to quote a distinguished visitor at the last Reception. Though familiar to members (and perhaps sneered at by austerity-conditioned moderns) with their handsome proportions, dignity and charm, they do convey to laymen the feeling that this is a worthy home for a great institution. The rooms look their best in gala dress and in it are a revelation to those members who know them only on workaday occasions.

Rather more than 1,000 members and guests seem to have enjoyed themselves fully. The official guests included members of the Diplomatic Corps, the senior officers of many government departments, representatives of several London municipalities, including the Lord Mayor and Sheriffs of the City of London and the Deputy Chairman of the L.C.C., the presidents and secretaries of other learned societies and the Royal Institute's own Honorary Fellows and Honorary Associates. This year there were no Ministers of the Crown who, presumably, were busy electioneering. Specially welcome guests were Mr. Edmund R. Purves, Executive Director of the American Institute of Architects, and Mrs. Purves.

The President and Mrs. Aslin received members and guests from 8.15 to 9 p.m. There were two concerts of music for two pianos, dancing in the Henry Florence Hall and an exhibition of Oriental Scenery in the Library.

Exhibition of Housing for the I.U.A. Congress

The President, Mr. C. H. Aslin, C.B.E., opened at the Building Centre on 18 May an exhibition of British Housing 1945–55. This is to be shown at the Fourth Congress of the International Union of Architects at The Hague in July. All member countries are contributing to the exhibition and the space allotted to each is consequently small.

The Building Centre undertook the financing and organisation of the exhibition, the material being selected by the U.K. Committee of the I.U.A., which is a committee of the R.I.B.A. It consists of 20 panels and was designed by Cassidy, Farrington and Dennys [*AAA*].

To represent adequately the two and a half million dwellings built since 1945 is impossible, so that the selectors and designers have had to make an arbitrary choice of about two dozen schemes. The London work includes the Ackroydon point flats of the L.C.C., Powell and Moya's Churchill Gardens at Westminster and flats at Gospel Oak, Drake and Lasdun's (Tecton) Hallfield estate at Paddington and flats in St. John's Wood by Edward Armstrong and F. MacManus. Rural housing includes that by Tayler and Green for Loddon R.D.C., a terrace scheme on a hillside at Beaumaris by S. Colwyn Foulkes and memorial homes at Lytham St. Annes by T. Mellor. Other architects whose work is shown are Eric Lyons, H. T. Cadbury-Brown and Basil Spence. Illustrations of housing at Crawley and Harlow represent the contribution of the New Towns. The exhibition opens with panels giving (in French) a succinct account of British post-war housing, with simple statistics.

The complete exhibition is related to a book to be published at the Congress containing an illustrated review of post-war housing in the countries participating. This book will include technical details on planning, structure and finance. Copies will be available in July and can be obtained from the Building Centre.

R.I.B.A. Diary

MONDAY 27 JUNE. 6 P.M. Annual General Meeting of the Library Group.

MONDAY 18 JULY–SATURDAY 30 JULY. Exhibition, 'Theatres and Theatrical Design'. Mon.–Fri. 10 a.m. to 7 p.m., Sat. 10 a.m. to 5 p.m.

Mr. E. Maxwell Fry, C.B.E. [*F*], and Miss Jane Drew [*F*] (Mrs. Maxwell Fry)

Sir Brunel Cohen, K.B.E., Master of the Gardeners' Company

The Deputy Chairman of the L.C.C., Mr. G. R. D. Bradfield, and Mrs. Bradfield

Mr. Gilbert Ledward, R.A., President of the Royal Society of British Sculptors

Sir Mortimer Wheeler, President of the Society of Antiquaries, and Lady Wheeler

Sir George Pepler, C.B. [*Hon. A*], and Lady Pepler

Lt.-Col. W. W. Dove, C.B.E., Master of the Carpenters' Company, with Mr. Frederick Gibberd, C.B.E. [*F*], and the Hon. Lionel Brett [*F*]

Sir William Reid Dick, R.A., talking with his daughter, Mrs. David Benton

Conditions of Building in City Centres

By Professor Sir William Holford, M.A., M.T.P.I. [*F*]

Read at the R.I.B.A. 17 May 1955

Mr. S. Rowland Pierce, Vice-President R.I.B.A., in the Chair

AN OLD SAYING, that has since become a history book tag, laid it down that 'Well Building hath three Conditions. . . .' And this evening my object is to inquire to what extent this statement still holds good. I am going to apply it to a particular sort of building—that which occurs in the core or centre of a town, and which, being so often a second or a third building on the same piece of ground, is not a simple but a complex architectural process. I hope to show that notwithstanding the fact that certain fundamental principles of civic design are as valid now as they were 2,000 years ago, the conditions of building in city centres are vastly different. Some of them, in fact, can hardly be brought at all under Sir Henry Wotton's famous umbrella.

Undoubtedly there is something wrong in the way that our cities—particularly the war-damaged ones—are being rebuilt. Perhaps there has always been something wrong, or at any rate lacking, since the days when Mediterranean man invaded these islands, built temples and baths, founded cities and settlements, and knit them together with a trunk road system.

'Politically and socially', wrote Collingwood and Myers in the *Oxford History*,[1] 'the civilization of the Mediterranean depended on the life of the town, and implied the conception of farmer as citizen. And citizenship was no metaphorical expression or legal fiction, it meant bodily presence in the city, personal attendance at assembly and law court, participation in a kind of life which could not be lived except in towns. . . . We inherit the words that once expressed it; words like politics from the Greek, and words like civility and civilization and citizenship from the Roman; [but for us these words are sublimated into metaphor] and we have forgotten what the Greek and Roman never forgot, that originally they had no meaning in abstraction from the bricks and stones of the city itself. This is because we are heirs of another tradition.'

Even if it is true, as this quotation suggests, that our idea of a city has never been very like that of the Greek *polis* or the Roman *civitas*, there is nevertheless something very unsatisfactory about the present state of affairs. In the first place we cannot, in our predominantly urban, industrial and insular state, be complacent about our anti-urban way of living. In 5,000 miles of sea coast, for example, there is hardly a space left for new development, which—if it were filled—would not spoil the very amenities which people come from the towns to enjoy. In the country, apart from a limited number of new towns, development is bound to be around existing nuclei. A Britain already 85 per cent urban will become even more so. And as longevity increases and population grows, the greatest good for the greatest number must surely be in the improvement of urban conditions and the enrichment of social life. But we really know very little about this process.

In the second place there is a good deal of very vocal discontent with the present results of post-war reconstruction. I doubt if it is of the type that is called divine; but it exists. And the fact that it has been to some extent fomented is beside the point. Just because there are a large number of people—including large commercial concerns and government departments—who do not care a scrap about the design of the buildings they erect or occupy, it is all the more important that others should care enough to make a fuss about it. Many town planning officers and consultants, including myself, have been at the receiving end of this critical system during the past few years. But it would not do us, nor anyone else, a bit of good to react in a purely defensive way, to justify our actions. You all know the French couplet that describes the fate of the man who answers back—

> 'Cet animal est très méchant:
> Quand on l'attaque il se défend.'

Self-justification is the curse of quite a large section of the civil service, most of the professions (except the armed ones), and of every government-sponsored Board and Corporation that has ever been created. But in a matter such as this, it is quite inadequate as a means of proceeding. It would get us nowhere. So, although it would have been closer to our sporting traditions, and (as it turns out) more in keeping with the spirit of the General Election now upon us, to take up a strongly partisan attitude, the contest could scarcely end in decisions of any real importance, since we are not even agreed about the rules.

Architecture, moreover, is the product of a civilization. It may even be the direct instrument of it, as in ancient Greece, or in the monastic foundations of the 12th century, or the country houses of the 18th. But it is an exaggeration to say that civilisation is a product of architecture, that we have only to conceive an environment in the pure essence of taste, to have it immediately peopled by financiers and factory hands, clergy and clerks, to say nothing of the town planners and common councilmen that have been anathematised by the President of the Royal Academy.

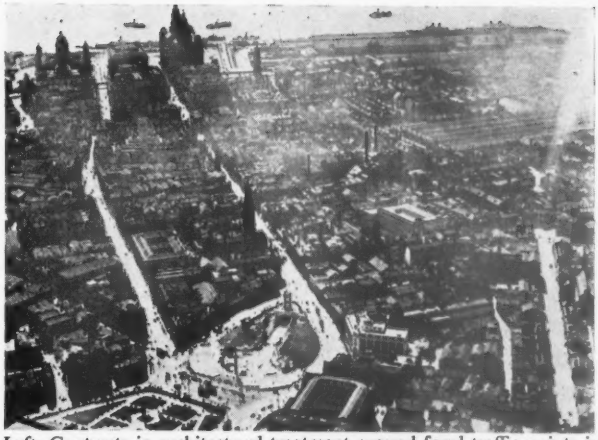
It is, I know, a banal thing to say—yet it is still terribly true—that any improvement that is not just a veneer on the surface of our civilisation must come from its stock and go down to its roots. Taste has to be achieved; it cannot be supplied in response to an advertisement. And the sources of improvement in building matters must surely be the patrons and the agents of building; which are ourselves, in our various guises and disguises—sometimes an elected body, sometimes a voluntary association, sometimes individual householders and sometimes the Press.

In short, this question of urban reconstruction is a major social issue. As Professor Glass put it in his book *The Town*[2]:—

'. . . Town Planning ought to come as an epilogue—as a means of solving existing problems and not as a problem itself . . . for the town is a social institution . . . and the problems which arise are social ones.'

At least it is worth asking—it seems to me—whether we, as thinking citizens, are really capable of acting as patrons of architecture in the way that the sociologist considers to be so logical and so necessary. The arts are peculiar in that they do not always wait for the pistol before starting down the course. If building cannot begin on a well-considered programme, it must begin on a sketchy one, or on none at all. It is a commodity the country must have, even when it cannot thoroughly afford it. This is why I think it might be useful to discuss one or two of the conditions, technical and administrative, that govern 'well-building' in the central areas of our cities.

Circulation. The first condition of building in the already built-up centres of our towns consists in coming to terms with traffic. There has always been congestion of a sort in city centres: one reads of it in 3rd-century Rome, in 12th-century Paris, in the London of *Pepys' Diary*. On the whole there has been some pattern in it—some discernible connection between cause and effect. The confusion of a street market or a fair is comprehensible. A public gathering, a procession, or a celebration demands a crowd. Even today the Lord Mayor's Show, or a presentation of the Freedom of the City, justifies the closing of streets. What is new in traffic circulation is not only the internal combustion engine and the increase in numbers, but the lack of relation between this accelerated movement and the environment through which it passes. It is as if the throng of the audience chamber had given way to the aimless criss-cross of the cocktail party.



Left: Contrasts in architectural treatment around focal traffic points in Liverpool. Left, the Pierhead; right, the Mersey Tunnel entrance.

The effect of this on the individual building or building group is well known to architects; yet we do not seem to have accepted the logic of the situation nor pressed for a cure. The fact is that no central building is self-contained. Even if it is not a traffic generator in itself, it has to find its place in the street pattern of the town; and at present that street pattern is either obsolete or inappropriate, or both. Millions of pounds have been spent on new accommodation in the central areas since the war (in the City of London alone £107 million has been spent or contracted for). But the amount spent on the improvement of circulation in the same areas is negligible (in the City, for example, it is less than ·01 per cent).

Even where the pre-war system of roads and railways, parking spaces, and piped and cabled services has to suffice for reasons of economy all sorts of inappropriate uses and additional functions are loaded on to them. Because the direct route through the centre of Cambridge is narrow and slow, and because Queens Road—which passes through 'the Backs'—is an existing by-pass from Huntingdon Road to the station, it is seriously suggested, even now, that it should become the trunk road for through traffic. Much the same argument applies to the East Carriage Drive in Hyde Park, between Marble Arch and Hyde Park Corner. To relieve congestion at these two points and in Park Lane, it is now proposed to sacrifice it on the altar of convenience. It is only a partial and temporary means of alleviation; for it is obvious that what is needed is a more radical solution to the problem of traffic congestion *as it will be ten years ahead*, and not as it was before the war. But cost deters us; and so the responsible authorities have to do the best they can with inadequate means. One cannot help asking, none the less, what the position will be when this tedious, difficult and by no means economical operation is over, and we have lost one more of those features which make London's Royal Parks almost unique in the urban centres of Europe.

With little prospect of general traffic improvement in central areas, the individual building is nevertheless conditioned to meet it, if and when it comes. Corners are splayed to give better sight-lines at pavement and street junctions, rear access is required for the larger commercial buildings, with self-contained loading docks in certain cases; and most important of all, parking space within the curtilage is now demanded by many planning authorities in order, primarily, to take as many standing vehicles as possible off the streets.

All this is quite logical; provided that major street improvements accompany these additional conditions for planning consent. What is not logical, however, is their imposition as an end in themselves. On the one hand the layout, composition and external appearance of the buildings is held to be a matter of comprehensive or unified design. On the other hand there is no comprehensive design for the pattern of circulation, as a whole, in the same area: there are simply standard requirements, which extend even to street lighting.

One of these standard requirements that has proved particularly difficult in practice is the stipulation that one car per 5,000 square feet of office space should be parked or garaged within the curtilage of commercial properties in certain areas.

In making a proposal of this kind for the City of London eight years ago,[3] Dr. Holden and I regarded this as a reasonable condition of building; and in theory I still think it is. In fact, however, the streets most affected have not been improved; the cost of providing a car-space (which usually has to be below ground) is between £2,700 and £4,000; and so far the main result has been not so much the removal of standing vehicles off the street, but the inducement to a few more owners to enter and manœuvre their cars within an already congested area.

It would, I think, have been more satisfactory to require allocated parking space on the same scale, either within the curtilage or within a garage or open-decked car park within a quarter of a mile of the new building. I did in fact propose this for the central area of Pretoria—the administrative capital of the Union of South Africa;[4] where the parking problem, though confined to a smaller area, is just as acute as in London. American experience can also show examples of the planning of both shops and offices with reserved or allocated space near by. In some cases offices are let with one or more such parking spaces included in the rent.

This and other kinds of parking provision would make for more reasonable conditions of building in a central area, so far as the standing vehicle is concerned. But for the moving traffic—the real dynamic of a city plan—we do not seem to be even in sight of a solution to most of our problems. The late Alker Tripp's 'traffic precinct' turned arterial traffic into sub-arterials, and these in turn into service or accommodation roads—a good principle in itself, but not yet applied to central areas.[5] The viaducts, clover-leafs and grade separations built in many down-town districts in the U.S.A. are obviously a move in the right direction. But again they are not comprehensively planned; that is to say they are expensive surgical remedies for existing congestion. And only too often in that enterprising country they only succeed in intensifying the congestion, at the point where the expressway branches off into a series of old bottlenecks. Le Corbusier's Cartesian solution,[6] to separate the buildings altogether from the fast traffic and give the entire ground level to the pedestrian, remains an ideal; and in spite of our achievements with the railways in the Victorian age, we have made no progress at all towards it. Traffic engineers have come to look on traffic as a kind of superfluid; architects are unwilling to go beyond the static composition in its three dimensions, and can hardly conceive of a design for velocities as well as for positions.

Physicists describe the degree of disorder in a physical system as the *entropy*; and it has been laid down that in any random process—such as traffic moving in different directions at different speeds—the entropy

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1583 Chambers. Hall End Row 12

1601-2 Chambers. S of Gate House
1607-8 Chambers. in Short Gallery 15
1609 Chambers. in Long Gallery 10
1611 Chambers. Chancery Lane Row 18
1612 Chambers. Garden Row 19

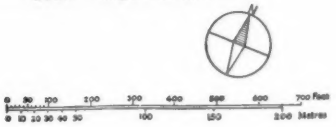
1621-3 Chapel 2
1624-8 Chambers. Library Row 16

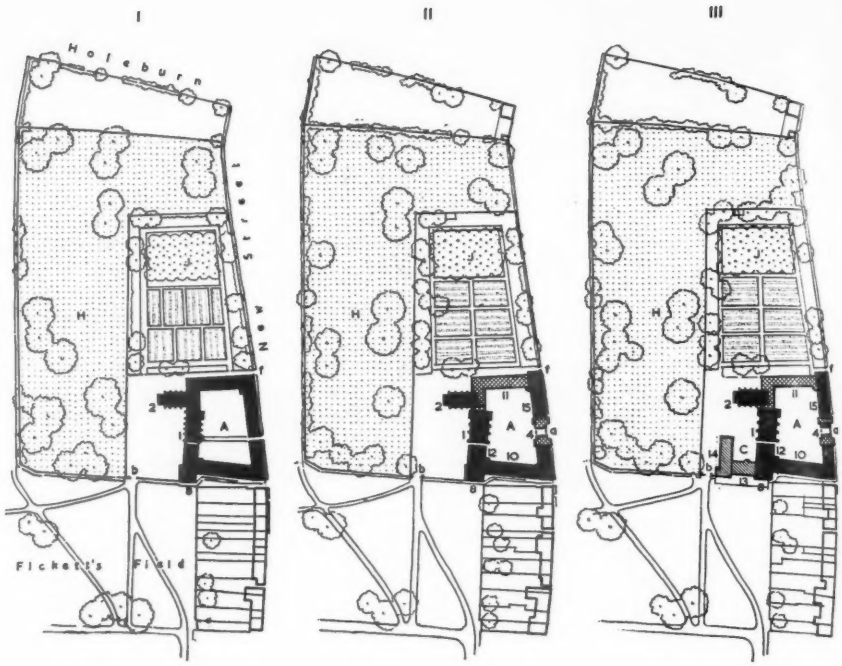
1688-97 Chambers. Serle's Court 23

1739 Pastry & Ovens 9
1775-8 E. & W. Wings, Stone Buildings 7 & 21
1780-5 N. Wing, Stone Buildings 20

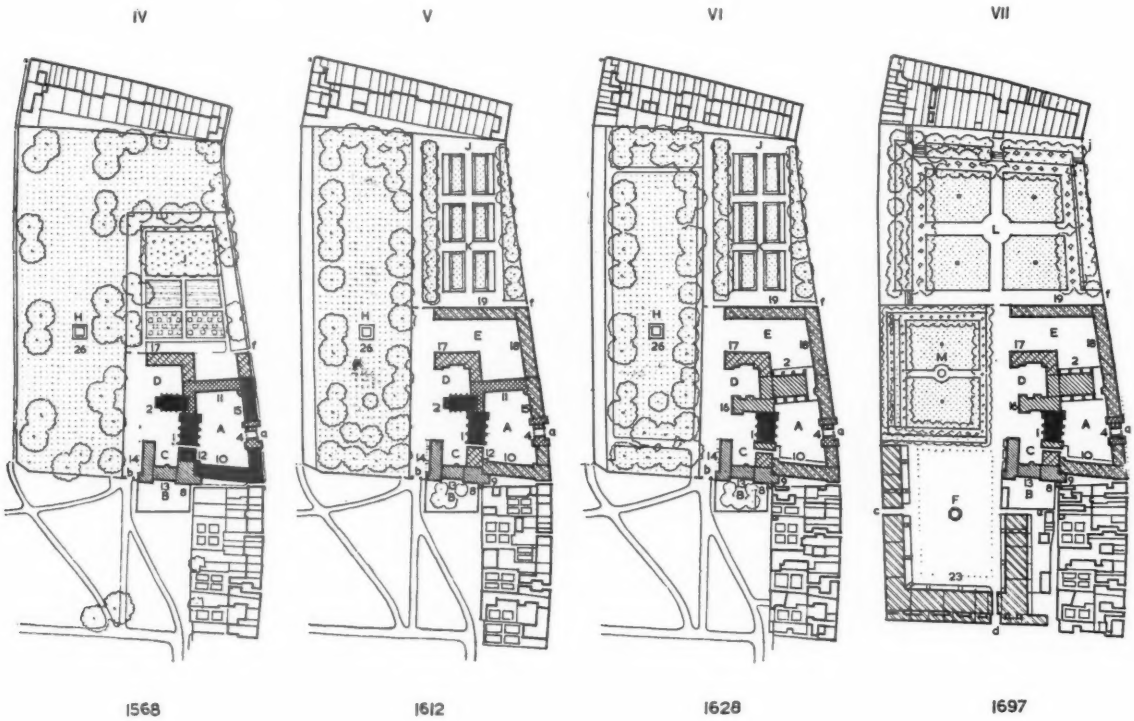
1817 Vice-Chancellor's Court 5
1818-9 S. End of Hall 1
1841 Temporary Detached Courts 6
1843-5 Hall Library & 7 Stone Buildings 1,3 & 22

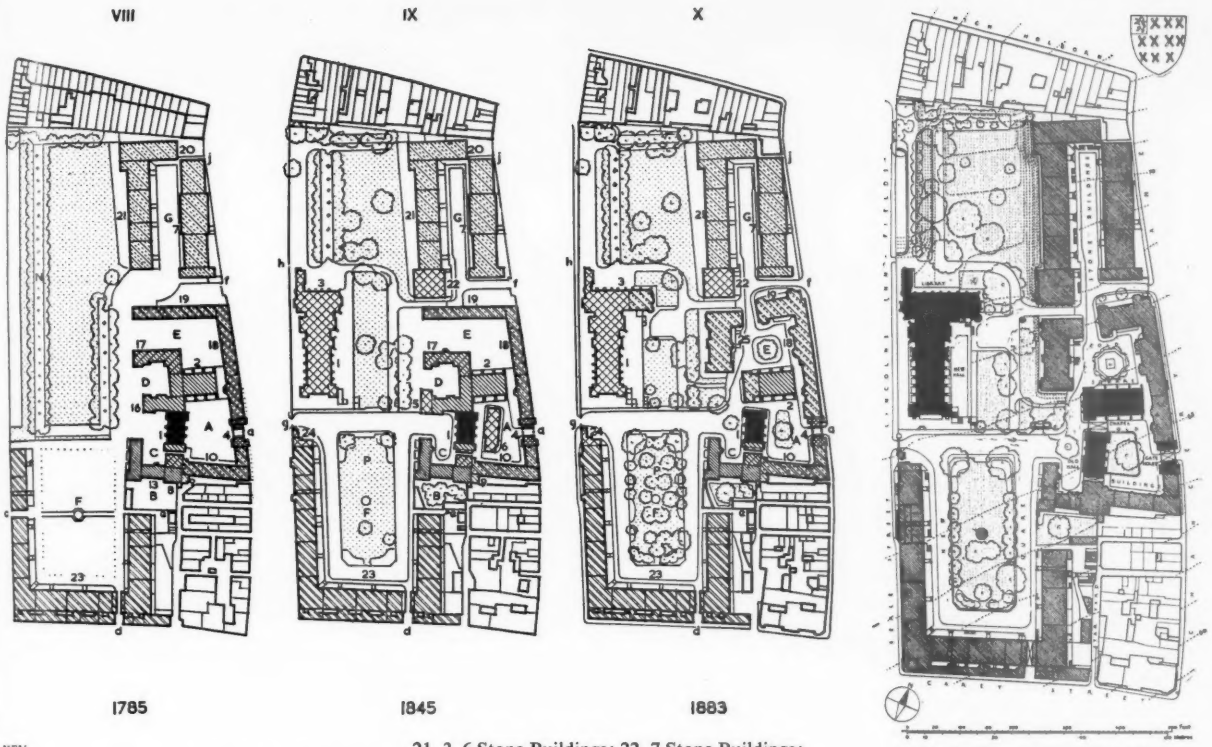
1872 Library Extension 3
1872-5 Chambers, 8-10 Old Square 26
1876-80 Chambers, 11-13 Old Square 18, 19
1882-3 Chapel Extension 2





On this and the opposite page. Plans of Lincoln's Inn, London, from 1230 to 1953. A continuous piece of estate development. From a drawing by Lawrence Baker, M.A.(Arch.) (Lond.), A.M.T.P.I. [*A*], University College, London





KEY

Buildings and Rows: 1, Hall; 2, Chapel; 3, Library; 4, Gate House; 5, Vice-Chancellor's Court; 6, Temporary Courts; 7, Register's, Accountant-General's and Six Clerks' Office; 8, Kitchen; 9, Pastry and Ovens; 10, South Row, Long Gallery or Stone Pace Row; 11, North-west Row; 12, Hall End Row; 13, Kitchen Garden Row; 14, Field Gate Row; 15, Short Gallery; 16, Library Row; 17, Dial Row or Chapel Row; 18, Chancery Lane Row; 19, Garden Row; 20, 1 and 2 Stone Buildings; 21, 3–6 Stone Buildings; 22, 7 Stone Buildings; 23, 1–11 Serle's Court; 24, 11A Serle's Court; 25, 8–10 Old Square; 26, Red House.

Courts and Gardens: A, Chancery Lane Court, Gatehouse Court or Old Buildings; B, Kitchen Garden Court; C, Field Gate Court; D, Middle Court or Chapel Court; E, Garden Court, Dial Court, or Old Square; F, Serle's Court or New Square; G, Stone Buildings; H, Coney Garth 12th C.; J, Long Garden or Cotterell's Garden 13th C.; K, The Walks 1608; L, Upper Garden 1662; M, Lower or Benchers' Garden 1662; N, Long Walk 1760; P, New Square Garden 1845.

Gates: a, Chancery Lane or Great Gate; b, Field Gate or Postern Gate; c, Postern Gate, Serle's Court; d, South Gate; e, Gate to Chichester Rents; f, Gate to Chancery Lane; g, Gate to Lincoln's Inn Fields; h, Garden Gate; j, North Gate.

Lincoln's Inn as at present (1953)

increases. The more mixed it is, and the faster it goes, the greater the disorder. Valuable as our experience is with traffic control—particularly that of the police—we have hardly begun to design for a reduction of the entropy, for a system in which positions and velocities are both accounted for; where the pedestrian is free, the slow traffic more orderly, and the fast traffic as closely controlled as that of tube trains in the London Underground.

Obviously, I cannot go into detail, as it would lead me too far from my main theme. But I would like to mention as a small example of what I have in mind, one scheme out of several where a more comprehensive approach to architecture and traffic is being attempted and where the primary designs are being—so to speak—welded into a 'grand design'. This is the Park Hill Redevelopment Scheme, near the City Centre of Sheffield.[7] Here Mr. Womersley, the City Architect, has planned a pedestrian precinct, rear access roads, parking, garaging, and slow movement by a complete system of street decks. Housing, shopping and traffic circulation are all part of a unified design.

This is something in the foreground; but for the distant future of this subject let me quote you a sentence or two written by a scientist, Kurt Mendelssohn.[8]

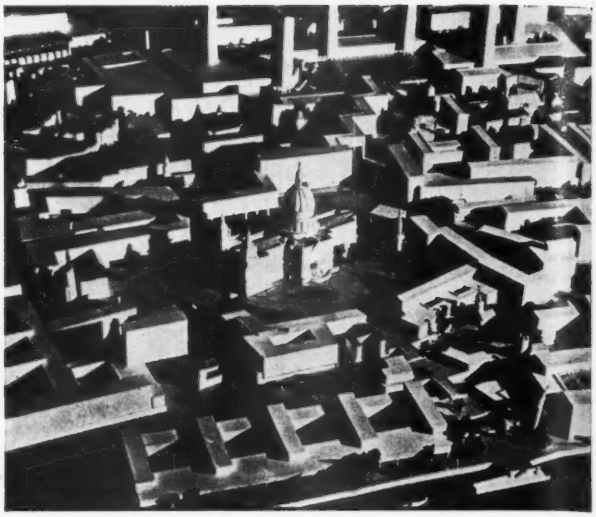
'. . . So far we have only considered a condensation according to positions, that is a crystal; or one according to velocities, and that is a superfluid. In a purely formalistic manner one can also postulate states in which both positions and velocities are ordered . . . this leads to a strange combination: a complex structure in ordinary space, which may, however, completely lose its characteristic features if it is subdivided even once. There is only one class of physical systems which shows all these properties, and these are the structures of living matter. Even a single living cell is vastly more complex than any inorganic structure, and its essential function, life, is irretrievably destroyed if it is cut in half.'

I do not want to attempt any pseudo-scientific analogies; but it does seem that in dealing with our three dimensions we might be more conscious of the other four.

Design and Lettable Area. The next condition of building in a city centre on which I would like to comment is the economic condition and its effect on the external appearance of the building.

It is quite common in practice to have to meet the requirements of more than one client. The planning authority represents the public interest. It tries to interpret the main recommendations of its development plan, which may have been approved—subject to modifications—by the Minister. It also tries to secure comprehensive rather than piecemeal development; and even when there are delegation arrangements in force it is the authority for development control, subject always to appeal. Its relation to the designer is by no means a wholly impersonal one. For every building of importance, as you all know, there are informal discussions in which the phrase occurs more than once: '. . . we (the

Skyline effects. St. Paul's Cathedral and warehouses.



Model of scheme for a St. Paul's precinct prepared by the Polish School of Architecture, London

Planning Authority) would like you to do so-and-so, quite apart from any regulations under the Building Act, or the By-Laws'.

The local authority may represent the landlord's interest; for, willingly or otherwise, by Compulsory Purchase Order or as a result of a Purchase Notice served upon it by a disgruntled developer, it may own the land. Or it may not be a local authority but a private company, or a Trust. In any case there are conditions in the building lease which govern use and bulk and access, and may even lay down requirements as to height, character and external appearance.

But somewhere there is the executive client—if one may so call him; with his surveyor and his accountant. This is the man who specifies the 'commoditie', leaving it to his technical advisers to see to the 'firmness' and to create the 'delight'. The perfect marriage of patron and architect should produce the best possible conditions for design. But who is the patron? The building owner, who may be building his firm's head office, or for part-occupation, or wholly to let, is concerned first and foremost to make his enterprise pay. The adviser who is really planning his building is his estate manager or his accountant.

All three are likely to leave matters of appearance, amenity and civic design to the public authorities; and they will expect their architect to see the scheme through the Royal Fine Art Commission, the Preservation Societies, and the local town planning committee—all of whom they regard from their own point of view as hazards. Elaboration of the machinery for passing plans simply increases the hazards; and this widens the gap between private and public interests. A speculative architect like John Wood at Bath, or John Nash in London, put his designs quite literally on the market; he knew that his patrons would judge him by them. Even Haussmann, in the rebuilding of Paris between 1853 and 1869, offered his clients a building venture in which design was an integral factor. But it is often the case today that even public-spirited owners disregard the factor of design, because it does not seem to them to be their business. If you doubt this, look about you.

The position of the architect in this situation is one of great difficulty. If his reputation is as great as his personality he may ignore the economic condition of building and concentrate on design. If he is a greater man still, he will bring his client round to his own way of thinking. History can afford us examples of patrons who have counted a fortune well lost in the achievement of a real work of architecture. But those examples are growing less frequent; and the more likely result of such an attitude nowadays is an uneconomic building (not necessarily an unprofitable one) which does not outlive its designer.

The architect who comes to terms with the economic problem, accepting it as one of the limitations of his design and making a virtue of it, can sometimes be fortunate and sometimes the reverse. There are occasions when public and private interests chime together like a peal of bells. More often, however, the high cost of building in central areas, which may run from about 6*s*. 4*d*. to 11*s*. 6*d*. a cubic foot (and which is still rising), forces the building owner to a very precise calculation of outgoings and income based on an amount of floor space which he forthwith regards as the economic minimum for the job. If it is reduced, the building owner says he cannot afford to go on. Yet the planning authority may ask for alterations, the highway authority for a set-back, the Royal Fine Art Commission for a reduction in bulk. Even the archaeologists may want to get at some Roman remains in the substructure. And if some uneasy compromise is reached on all these points there is still the risk that an indignant citizen, months later, may realise what is about to happen to a site for which he has a sentimental regard, and write to the papers saying 'Is it too late to prevent this great opportunity from being frittered away!'

With the next level of building activity, in which the architect (if there is one) himself does not attempt to do anything beyond meeting the demand for accommodation, I need not say much. The remedy is obvious. But I cannot resist making one comment, which I hope will not sound too satirical. It is that a good deal of this kind of property, erected after the Great Fire of London, in the early 1670's, is just the kind of building that we are now most anxious to preserve. It is comparatively small, unpretentious, restorable, and human in scale; the lowest common denominator of the urban sum. Personally I would not be very concerned about such humdrum building today, unless it loses those qualities and becomes enormous in scale or pretentious in character.

But for the rest, what remedy can be found? There are many in this room who have much experience in these matters, and I hope they will discuss it. Since I am the provoker of discussion, however, perhaps I may be allowed to make three points by way of preliminary.

The first suggestion is one of method. From the point of view of civic architecture the interests in building promotion appear to be too divided. The public patron is very largely supplanting the private one, and yet—paradoxically enough—the public interest in architecture is not being so well served. Could there not be a greater concentration of interest at one point in the sequence? Could not the landlord combine public conscience with private enterprise, and become the real patron of the designer? The history of estate development in this country, at least in the past three centuries, has been more interesting than that of complete town building. Regent Street and the Regent's Park is a good example of a planned project; Lincoln's Inn of a unity that has been maintained over centuries. Could we not more frequently apply the experience of the great urban estates to what is now called 'comprehensive development areas' in our towns? The owner of the land could be a local authority, a public body, a Trust; and should be held accountable for it in all its aspects—social,

The St. Paul's Cathedral area at the present time [*Photo: Aerofilms*

economic, architectural. The landlord should appoint his architect and his other technical advisers, he should obtain a 'clearance' for the site, write a careful programme for the designers to work on, and approve necessary amendments afterwards. This would be no formal matter of administration; it would be personal and particular—an active promotion of a scheme, in which all the participants would have a common interest to produce something not only economic but worth while.

The second point is one that has been made before, by Richard Llewelyn Davies and others. It is that structural research should be extended into the social field so that we can find out something more about the *uses* to which buildings can or should be put, the kind of programmes that will fit those uses, and the ways in which such programmes can be formulated. This is a job of client-education as well as of architectural research; and I do not suggest that it will solve all our problems. But it is certainly interesting to see what it has done for schools, under the sponsorship of the central and local education authorities, and what it is beginning to do for hospitals and laboratories with the help of the Nuffield Foundation.

The third point is an unusual one; it concerns public relations. When almost all estates were private estates, an unwritten code of conduct governed the negotiations and procedures. Apart from very accurate forecasts of buildings drawn or engraved for the Royal Academy, there was little public criticism of development until it was completed. An individual architect or surveyor would act on behalf of an estate one day—in much the same way as a planning authority does now—and submit a design of his own for another surveyor's approval, the next day.

Now, under the provisions of the Planning Acts, an application for permission to develop may be made by anyone—whether he has an interest in the land or not. The semi-confidential nature of the procedure is no longer observed. I do not say this is a bad thing; I am only concerned to show that it is quite common for the design of a potential building to be shown to the public and reproduced in the Press before there is a client or a building programme at all. And under these circumstances the more old-fashioned landlords and their estate managers also find themselves a focus of architectural interest and inquiry long before their plans are settled, or an executive architect appointed. In central areas, more especially, something has to go into the shop window at an early stage, and be made available to the Press, even if the designs are subsequently altered. This seems to be essential not only for purposes of comprehensive design, but as a concession to public interest.

This is really a problem of presentation. Models, or photographs of models, to a small scale, are sometimes prepared in block form. Occasionally elaborate perspectives are drawn. The danger is that laymen and authorities alike may fix on a building form that has been designed from the outside inwards, instead of from the plan outwards. It is then difficult to depart from it. Nevertheless there is much to be said for some form of presentation at this preliminary stage; and the planning authorities themselves could take a larger hand in it.

The Friction of Space. To describe the third condition of building—the last which I have time to mention this evening—I have borrowed a sociologist's term, 'the friction of space'. The term is applicable to the town as a whole, but in a particular degree to its core, the place where maximum accommodation and maximum circulation occur together.

The visual symbol of this condition is the mediaeval walled town, as depicted for example in the maps and views of Braun and Hogenberg. The town first appears like a flat shopping basket with a few valuable objects carefully placed in it, and plenty of space around them. Later, the town appears like the same basket at the end of the shopping round, stuffed with toys, the larger ones sticking up above the rim, and producing a silhouette. Towns that grew without fortifications, on the other hand, were not so restricted, but developed congestion at the centre, just the same, by centripetal pressure. London in the 18th century, and St. Andrews right up to the present day, show characteristic silhouettes arising out of congestion and constriction respectively. Above the general level of the roofs and chimneys, the towers and spires are decorative or pious adjuncts to a workaday world.

The 20th-century city is emptying out from the centre its residential buildings, its theatres and churches, its factories and its playgrounds. In their place it is concentrating financial and administrative buildings, exchanges, offices and banks. The new buildings are not interested in silhouettes and have no money to spare for towers and cupolas, turrets and ornamental roofs. A decent lid for the tanks and lift-motor rooms is the most to which they aspire; and silhouette, if it is to be achieved at all, is made from the body of the building itself and not by any ornamental headgear. Even to succeed in this, a comprehensive treatment of groups of buildings must be possible, such as for the Rockefeller Centre in New York or the Back Bay project in Boston.[9] And the principle behind these compositions is an aesthetic principle, no longer based on the symbolic or emblematic ideas of mediaeval or renaissance times, but deliberately controverting them. Cathedral and palace no longer dominate secular buildings; the guild halls of the City Companies are moving into the basements of rent-producing commercial structures. Instead, one slightly taller office building projects above a host of other office buildings, or—more logically—a ring of tower blocks, or a pattern of slabs of equal height, stands sentinel over the historic core of the city.

The more I think about this kind of development, the more hope I see in the accentuation of this difference between the old idea of scale and silhouette and the

new—a difference that has already occurred in the social and economic functions of a city centre. An office block 300 feet high, not far from St. Paul's, and designed in the style of the western towers of the Cathedral would, I think, be offensive as well as absurd. But a widely-spaced group of such towers, impersonal, unassertive and aloof, their vertical lines predominant, their surfaces reflective in terms of light and atmosphere, and their outlines simple, lean and entirely without fuss—that, I think, would be acceptable, and might even be interesting; even though it would mean shifting some architectural value from the skyline to the ground line.

At any rate I can think of a number of alternatives that would be far less satisfactory. For example, the gradual submerging of the traditional skyline under a rising *general* level of new buildings whose silhouette would be aggravating rather than neutral. I am leaving out of consideration altogether family housing in tall blocks of flats as these have their own space requirements which just cannot be met at present on land of exceptionally high value. Apart from this, the biggest problem in central areas consists in coping with quantity. If quantity can be stacked in orderly vertical piles, then quality—the historic monuments and exceptional buildings—can be given the space and the setting it deserves at the ground level, where it can be most appreciated. In a city centre, space in the midst of congestion is the most fabulous of all luxuries. Unlike the ancient Greeks we do not do without things; we have perhaps too many things —too much of the apparatus of living, too many cars and loudspeakers and filing cabinets—and not enough of the real urban pleasures such as conversation and social occasions and freedom to walk about the town. And so, it seems to me, we ought to endow our buildings of architectural interest, whether they are contemporary or of the past, with sufficient space to enable us to use them and to look at them. At the same time, if efficiency of distribution and productivity in industry is to be maintained, the centre must provide at least headquarter accommodation for these activities and for the finance houses, the exchanges and the commodity markets that go with them. Otherwise, as can already be seen in the older towns of America, these central elements will move out of the city altogether and leave it to decay; and this is by no means a graceful form of decay. How otherwise can be combined the three kinds of space required in the central area of a town—production space, circulation space and leisure space—than by piling up one in the vertical plane so as to disencumber the horizontal plane for the benefit of the other two?

If this theory were put into practice it would, of course, demand comprehensive design and an over-riding control on the quantity of accommodation that town services and transport would permit. I have already suggested how areas of comprehensive development might be planned, on estate lines, as unified building operations; and these would obviously follow an appreciation of the town pattern of use and density zoning (including that particular reflection of zoning in the third dimension—the town silhouette) by the Planning Authority.

As to the floor space control, this is as necessary but as negative as all forms of regulation unless combined with imaginative handling of the limitations and opportunities which it embodies. Central London has now had some years' experience of a control based roughly on a ratio of 5 to 1 floor space to site space. The control has been criticised as being either too rigid or too flexible. Inasmuch as it is regarded by many developers as a minimum (which they are aggrieved if they cannot obtain), and since ministerial policy has now changed in the direction of *reducing* the employment opportunities in the centre, so as to increase them in the new and expanded towns, it is probably true that the plot ratio and the floor space index need reconsideration. Had they not been applied—and I think I am right in saying that London City and County have pioneered in this matter—how much worse would the present situation have been. Despite traffic delays and the dissatisfaction expressed over the architectural form of much of our post-war reconstruction, London retains the special attraction of what Steen Eiler Rasmussen[10] has called 'the scattered city'. It is still open to improvement. And in comparison with other and better-planned towns whose pattern of growth is denser and more fixed, this is in itself a virtue. Most British towns, in fact, assisted by a sound and consistent policy of dispersal for all those activities which are not essential at the centre, could still solve many of the problems created by the friction of space. But it is only too clear that in this context, time is not on our side.

* * *

In these reflections on a few of the conditions of building in city centres I have touched on some enormous problems; but they are by no means merely theoretical. I have suggested that in planning the comprehensive development that our towns require, the local circulation should be designed together with the building forms. That is what town planning means.

Then I have suggested that the landlord should be the real patron, if comprehensive design is to be possible.

Finally I have suggested that there may be two scales of building—the anonymous quantitative and the special or qualitative that can be appreciated from the pedestrian level. I am well aware of the fact that I have not said anything of the slightest practical use to the architect faced with the problem of putting more floor space on a given area than the site will hold, meeting all the requirements of the authorities, keeping down the cost of building (now standing at nearly 370 per cent of what it was in 1939), and at the same time producing a significant piece of architecture. My conclusion is, of course, that the individual design has little chance until the 'grand design' is improved, together with all the conditions necessary to its 'well-building'.

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VOTE OF THANKS AND DISCUSSION

Sir George Pepler, C.B., F.R.I.C.S., P.P.T.P.I. [*Hon. A*], moving a vote of thanks to Sir William Holford, said:

I feel it is indeed a great honour to be permitted to move a vote of thanks to Sir William for the paper which we have just heard. He has, as you know, an unrivalled knowledge of the subject, and in his usual manner he has imparted that knowledge to us with wisdom illuminated by wit and has accompanied it with most interesting slides.

The paper opens up many avenues of thought for discussion, but I propose to confine my few remarks mainly to what seems to me to follow from his first proposition, with which I think we must all agree, namely, that 'The first condition of building in the already built-up centres of our towns consists in coming to terms with traffic'.

Unhappily, he had then to point out that, in the City of London, no serious attempt had yet been made to come to such terms, and the main reason for this—as I read and understood his paper—is largely due to the enormous and excessive cost of land in the City centre.

These high land prices exist because, as Sir William says, this centre must provide accommodation for the headquarters of industry and 'for the finance houses, the exchanges and the commodity markets that go with them'. But he then goes on to say: 'Otherwise, as can already be seen in the older towns of America, these central elements will move out of the city altogether and leave it to decay.' Decay is caused by congestion, and with decay land values must drop.

In order to prevent decay (and one must not forget the high proportion of vacant office space within the City just prior to the last world war), these central elements must be provided with adequate elbow room and traffic circulation.

Is it reasonable that the whole cost of preventing decay should be placed on the public authorities? It would probably be simplest for the City Corporation to buy all the land and thereby become the landlord able, in Sir William's words, to 'combine public conscience with private enterprise,

and become the real patron of the designer'. But it must not be forgotten that the City would have to buy at prices which, at the moment, do not reflect the inevitable decay which only action by the Corporation to secure space for the movement of traffic can prevent.

The rebuilding that has taken place and is at present taking place shows no evidence of either 'coming to terms with traffic' or forming part of a 'grand design'. Let us hope that it is not too late for such a design to emerge. It is in any case most fortunate that Sir William has been commissioned by the City Corporation to prepare detailed proposals for the planning and architectural treatment of the area around St. Paul's; and one trusts that that area is sufficiently large to enable him to secure that if high towers of offices are to be erected they will not only be surrounded by space adequate for the assembly, circulation and distribution of traffic but be sufficiently far removed from St. Paul's not to signify another attempt by Mammon to overcome God. One trusts they will also be (and here I quote from the paper) 'impersonal, unassertive and aloof, their vertical lines predominant, their surfaces reflective in terms of light and atmosphere, and their outlines simple, lean and entirely without fuss'.

Mr. Frederick Gibberd, C.B.E., M.T.P.I. [*F*], seconding the vote of thanks, said: To-night Sir William has been remarkably interesting and has again shown his extraordinary scholarship. He has drawn from a great fund of experience acquired over the years. And I agree so much with his humanistic approach to this problem that I can find very little to quarrel with.

I think we are all agreed that most or many parts of the City centre are best approached on foot. The old idea of a compromise between motor cars and shopping centres is dead. No compromise is possible. We tried at Harlow; we were bullied by our planners into putting a street in our shopping centre, and now the public are agitating to close it.

If the city is a series of precincts with the circulation between, we must obviously associate car parks with the precincts in some such form as parking reserves or multi-storey parking. To these I would add car parks associated with inner and outer ring roads. Many people are coming to accept that they cannot drive to the core, and they are content to get near to it and use public transport or a taxi, or even walk. If you have places for car parks on these roads, you are bound to draw off quite a lot of traffic from the core itself. I think it can be done; indeed, I know it can be done, because I am working on a centre in the north where we are going to do that very thing.

A second point is the master designer. The reason why so much reconstruction is failing is that there is too big a gap between the town plan and the individual site. We have the town plan, a very broad background. It only sets the main structure and lays down a few rules. Then we have the building site itself, a detached architectural problem. The intermediate stage of comprehensive development Sir William talked about requires a master designer to lead a a team. Without comprehensive studies, without such a master designer, you really cannot have town design. That has been the chief trouble in the City, and it is with much relief that we learned Sir William was going to deal with St. Paul's. It is a great pity he was not appointed long ago. He has done a good job.

Mr. B. Bednarczyk: Architecture in England seems to have been approached in a similar way to medicine. Reconstruction is only undertaken when something is wrong. It would be very useful if we were to approach it from the point of view of preventive medicine. When we are ill, medicine is essential. We can analyse and tabulate and base our preventive measures on the results.

It is a very good thing to control traffic and to build huge roads. You might have very extensive car parks. But I think the solution is to eliminate the necessity for such great conglomerations of traffic in certain areas. Why have such a great city as London, in the first place? Why not let it decay, if it is going to decay?

Mr. Gordon Steele [*A*]: I am a Scot and still young enough, I hope, to be an idealist. I should like to take up some of Sir William's points and to put forward ideal suggestions. They may be too ideal for us to carry out, but at the same time they might, in the course of years, lead us or our great grandchildren to some adequate solution of the problem of city planning in general.

Sir William, in the course of his talk, mentioned first the greatest good for the greatest number as being the solution for tackling urban development. Later, he discussed the friction of space and also the influence of the ever-increasing volume of traffic on city planning. He referred also to the loss of urban dignified life due to the increasing impedimenta of living; I could not agree with him more over that.

It seems to me that we have possible solutions. The prime one, of course, is completely out—or may not be completely out—of our control at the moment. It is the reduction of the population. This country is grossly over-populated. Before the war, people complained about the falling birth rate because we should be left with a nation of sixty-year olds. We probably should, for ten years. After that the natural balance would be established. We should have our room. We should not have to go to the extent of expanding. We could let places decay, as the last speaker said, and rebuild them in a condition of dignity and space.

I think I am historically correct in saying that in this country most of the large consciously planned schemes were the work either of individual developers, mostly speculative, or of patrons. In either case, they were people who were sufficiently their own masters to do what they liked and not consider other people's opinions very much. Would it not be possible for authoritative bodies, such as the London City Planning Commission, or whatever it is called, to take that attitude? Could they not say, 'This is what we are going to do. You may not like it, but you will have to lump it'? This might conceivably result in some measure of unity, dignity and completeness about the whole thing.

Mr. A. R. F. Anderson [*F*]: Sir William has shown in his lecture, which I believe lasted one hour and twenty minutes, vast knowledge and immense scholarship. He has covered such a wide range that I really feel very humble, particularly as I have appeared on several occasions recently as a suppliant before Sir William in one of his many capacities, two in particular: as consultant to the City Corporation and as a representative of the Royal Fine Art Commission.

On these occasions, whilst feeling slightly as though I were on the gridiron roasting gently at the Inquisition, I have readily appreciated that Sir William knows all about it and that there is no point in bluffing.

He has shown on these occasions not only his fine scholarship and mastery of his job but also immense sympathy with the architect who is trying to satisfy so many different so-called clients of one sort or another: trying to get the maximum floor area for those supposedly grasping city industrialists; trying to be a decent architect all the time and to design a fine building; and trying to please the City Corporation, the Town and Country Planning authorities, the London County Council and all the other people.

Sir William has always shown the greatest sympathy and given the greatest help. On that ground alone he is immensely to be congratulated, and I hope that he will go on from strength to strength in this sort of job.

Mr. R. H. King [*A*]: There is one question I should like to ask Sir William. Does he think it is right for the planning authority to undertake the redevelopment of the central areas which, after all, are the most expensive areas in a town, if we are going to ask them to do it on the basis that they are the best people to correct congestion which arises from the actions of individuals? Can I pose the problem not of individuals who form society in general but of what is going to be done to help the planning authority to carry out the job?

Mr. Alan Knapton [*A*]: There would appear to be two particular problems which require two different approaches when central areas are planned, at least in the City. There are extensive areas of war damage where comprehensive planning is not only possible but the only right answer. There are unfortunately other areas which are less extensively war damaged but are nevertheless in process of being rebuilt where the comprehensive approach is probably less attainable.

Sir William has said that we lack a patron, which is quite true. It is suggested that the obvious patron could, in fact, be the local authority. It has both the power and in most cases the finance to carry out a comprehensive scheme of replanning.

In the areas where the damage has been less extensive and where private developers are doing their best to get back what they had on the site before, two particular problems bedevil the issue. One is the imposition of a direct ratio which has been invaluable, as Sir William has said, but which has now come to be taken as the very minimum one can expect on the site. There is also the Third Schedule of the Town and Country Planning Act, which says indirectly that you can have back what you had there before plus 10 per cent. By the time the new improved lighting angles have been applied to any of these buildings, you get a hotch-potch collection of setbacks on the various sites which do not amount to architecture at all. They are structures enclosing floor space. There is a problem here, I think, where congested sites are in areas of less extensive war damage. Here the city authority is less able to help, and it is very largely a question of making the best of a very difficult problem.

With regard to the larger areas of war damage, I should like to hear Sir William come down even more firmly on the fundamental necessity for complete acquisition by the authority, because it is quite impossible otherwise to obtain the desirable feature of high blocks on some sites and low blocks on others because of the separate ownership.

The only other point I want to make is that I think everybody is thinking at the moment in terms of high blocks. It is important in cities where high blocks are going to be built that we should have some on the human scale, some small buildings and some small squares. It is possible to provide large open spaces, and one can produce large blocks and small blocks with small intimate squares. These are a most desirable feature in any city plan.

Miss Elizabeth Denby [*Hon. A*]: I want to rush in where the angels fear to tread on behalf of the ordinary citizen. I do feel that we citizens of various towns in Britain are troubled by the fashion at the moment for comprehensive development, particularly when it is put forward in town planning schemes. It is very often forgotten by the planner, I think, that the town is very often dear to the people who live in it. When an area is comprehensively redeveloped, their history and their roots are swept away and some new development is put up which has very little to commend it to the people whose town it is.

What really made me get on my feet was the Scotsman who first said he was an idealist and then went on to say that architecture should follow a comprehensive system of redevelopment. The authorities should go ahead, and the people should take what they got. I do not really feel that up to the present people like very much what they have got. They have been given what the architect and planner wish them to have. I do feel that the architects and planners should leave some of the roots and some of the parts in the areas which people are fond of and which express the past of an area. They should go in for a little elegance and charm, and then, I think, the citizens will feel less bitter about the planning which is being done for them.

The Chairman: I should like to say, on my own behalf, that I have enjoyed the paper very much indeed. Sir William has given me a lot to think about, because I also have some slight experience of having to carry out practical town planning that has got beyond the stage of paper. I feel strongly about many of the things he has had something to tell us about.

Sir William Holford: There is not very much to reply to, except a lot of very undeserved words of commendation. Frankly, I did not expect them at all; I thought I was going to be torn to pieces on a number of points.

This does give me an opportunity, however, to say that I do not think they are by any means settled. I was asked to talk on a subject of this kind, and I very deliberately called my paper 'Conditions of Building . . .' because it seems to me that we do not quite realise how difficult those conditions are. We have, in fact, rushed into print considerably in the last few years, saying that something is wrong. But we have not really looked at the conditions.

Sir George Pepler referred to the problem of traffic. I do not believe it is solely a question of cost. I think it is also a question of where we decide to put our money. The money is there. We are literally spending millions on buildings, some of which are entirely speculative. Yet we do not get from Parliament, from the funds of the Ministry of Transport and through to the local authorities, more than I have suggested—about ·01 per cent—for the improvement of the circulation without which those buildings are incomplete and sometimes obsolete the minute they are put up.

My first plea was very strongly not addressed to the architects but to ourselves as the public in making it only too obvious on every possible occasion that if we are to have any form of comprehensive planning, whether a popular movement or planning by the authority on behalf of people, we shall need many more tools than we have at the moment to do the job properly.

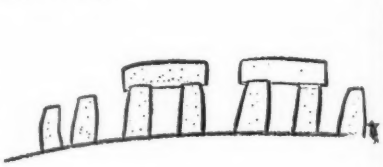
It is extraordinary to me when we have the debate on the Ministry of Transport vote to see how everybody puts in the most piffling little ideas about how to train school children to cross streets and so on, but we never really tackle this problem of how we are going to bring the circulation pattern more up-to-date with the efficiency of the buildings. The buildings we are putting up are extraordinarily efficient, compared with what they were in the days of the horse and carriage.

This gives me a chance to say something about the problem Miss Denby raised of the ordinary citizen. I did not go very far in my suggestion about who the patron should be. I have a great number of thoughts, dangerous thoughts, on that subject. But I do believe one of the things that might be tried out is the Trust; that is to say, the local authority with added members, acting as the landlord for certain defined areas. As Mr. Knapton remarked, only too appositely, there are large areas in our cities where comprehensive development is at the moment impossible. It is not only a question of ownership. It is because of the standing buildings. In those areas, what is required is broad control and an opportunity to the individual to show what he can do, which is considerable on many occasions.

But there must be places where someone has to think out how a really great improvement is to be brought about; and that person ought to be a human person. In other words, there ought to be a personal relationship between the designers, all of them: engineers, architects, interior people, and the people who are counting the cost and who are getting that cost from or accounting for it to Parliament or the public in another capacity.

What I feel is that we have to cut at both ends of this long sequence. We have to get to the point where we can say 'This man is doing this building. Let us see what it is before we criticise him. Let us give him a chance to get hold of the best people he can and make a good job of it.' Two or three of the best schemes I know in the United States have been done in that way. Somebody has taken on the job of promoting the development, and instead of fighting the authorities he has in fact started off on the right foot, so to speak, by getting their co-operation and goodwill in the first place. Then they have said, 'Well, if he does not make a success, we wont give him another chance.' In other words, he has to have a public conscience, but also he has to have a little of that enterprise which no departmental interest can ever properly secure. That is the whole essence of my paper.

The aesthetic question is one about which we might argue for many hours. I am extremely grateful to Mr. Gibberd, whose book, I may say, tells you more about this subject than I have done this evening, and to Sir George Pepler and Mr. Anderson for the very kind things they have said. I am sorry I cannot reply individually to actual points that were brought up in the discussion. All I can say is that I think it requires another occasion to do justice to some of the big questions thrown at me, such as reducing the population and letting London die.



Oakwell Hall, Birstall (the original of Fieldhead in *Shirley*). From a drawing by Martin S. Briggs [*F*]
Block lent by THE BUILDER

Papers read at the British Architects' Conference held at Harrogate, June 1955

The Organisation of the Building Industry and the Architect's Responsibilities

By Sir Thomas Bennett, K.B.E. [*F*], and
D. E. Woodbine Parish, Past President, London Master Builders' Association

SIR THOMAS BENNETT

OVER A VERY CONSIDERABLE PERIOD the value of the architect to the community has been judged by his ability to produce fine buildings, and as a profession we have perhaps been led to think of ourselves as artists in three-dimensional planning and designing for posterity. Posterity has little regard to the cost of the building at the time of erection, the period it needed for building, or the regulations which governed it at the time it was built. As long as the work of architects was primarily confined to the outstanding buildings of their time, this principle of judging the architect as an artist was probably true, but as buildings have been needed more and more for the everyday uses of the normal member of the population, so have economics intruded to a greater and greater extent upon the work of the architect. The public has also tended to judge the architect's work as much by his success in keeping to strict schedules of time and estimates of cost as by his power to give them a fine building when the task was finished. On the other hand, it is not unlikely that public taste as a whole has tended to rise, notwithstanding the criticism of modern work by older minds, and the architect is therefore faced with criticism from the point of view of the efficiency of his plan, the beauty of his elevations, the extent of his grasp of the scientific developments which have impinged on buildings, his power to spend large sums of money with regard to the value received in exchange, and above all, a power to handle men and a capacity for administration. This forms a formidable list of qualifications which few men can hope to acquire reasonably competently, and the answer can frequently be found only in partnership. On the other hand, public work looks for the answer in departmentalisation. This multiple and diverse pattern of qualities and achievement undoubtedly represents the public view of the architect. It is in an attempt to study the extent to which the individual architect, the architectural partnership and the architectural department can fulfil the public ideal that this discussion is instituted, and the views of architects at this Conference may well cover an extremely wide field.

There are extensive indications that the public is appreciating the value of the architect in controlling its building proposals, since the percentage of work controlled is greater than at any previous period of building history. The profession as a whole is taking a wider view of its responsibilities, and the architectural press is reflecting this approach of the profession by attempting to disseminate the knowledge required in all fields of construction, equipment and detail. The leading architectural papers no longer confine themselves to the reproduction of drawings and photographs of fine buildings or fine photographs of the internal treatment of buildings. They almost invariably contain extensive articles which analyse particular sections of equipment, whether it is ironmongery, doors, balconies or heating schemes. The articles which cover such widespread items indicate the different types available, the sources from which they come, their relative efficiency, and at least give an indication of their relative cost. The profession, therefore, may consider that it is rapidly travelling along the path which the public would have it travel, and is doing its utmost to ensure that its qualified members reach the standard public opinion demands.

Building has undergone a fundamental change in the half century between 1900 and 1955.

In 1900, building was almost entirely a craft industry. The construction was of load-bearing brickwork or masonry, the floors were largely of timber or of very simple iron construction, and the finishings and equipment were of a similar straightforward character. The preparation of the drawings for buildings of this kind could be made entirely in the office of a competent architect, and the drawings so made were issued to a contractor, who in turn employed directly almost the whole of the men who were engaged in the erection, and in the great majority of cases he executed in his own yard the masonry, joinery and other finishing work which was ultimately part of the completed building.

The engineering aspect of building was in its infancy, and many buildings had only slight engineering equipment. This was true of structural steel, reinforced concrete, heating, electricity, lifts and other services.

The great majority of buildings were erected for wealthy 'patrons' who were individuals, local authorities and government departments. The buildings concerned were largely town and country houses, town halls, museums, churches and similar structures. The distribution of wealth at the time was such that buildings of this character, when commissioned, had as their major objective the creation of a fine building more or less irrespective of the ultimate cost or time taken in erection.

In the space of fifty years the approach to building has changed, so that we are now faced with an attempt to design buildings which are of widespread value to the individual members of the population, and attempts are being made to house people in new houses on an unprecedented scale, to create so large a number of schools, shops, factories and other utility buildings that the nation is equipped as quickly as possible with structures which conform to the efficiency needed by the nation. This approach to building has meant that time and cost have become paramount factors in the solution of the problem.

A growing aesthetic taste has brought within the normal work of the architectural profession many buildings which in 1900 were erected as purely utilitarian structures. To a large extent this applies to factories and houses, and in a more limited extent it applies to certain other classes of buildings, such as schools, railway stations, electricity generating stations, and other buildings which 1900 was satisfied to produce to a common pattern once a design had been created. This resulted in the erection of buildings which, to a large extent, were built irrespective of local conditions, environment and other circumstances.

The Development of Engineering Services. As steel, reinforced concrete and electricity developed, individual men or firms studied the requirements of these services and developed companies which prepared designs and gave quotations for the work, so that design and construction were intimately married and associated with the limited number of people who possessed the necessary technical knowledge and equipment. Thus the sub-contracting specialist firm came into existence.

The Building Crafts. Many factors contributed to change the system of operating with individual craftsmen employed by the main building contractor, and to create sub-contracting specialist craft firms. The serious booms and slumps of the 20th century caused the builders to seek contracts far removed from their headquarters, where the transport of their own equipment and men was financially impossible. The increasing intensity of competition created specialists who, by retaining groups of men constantly employed and mobile, and developing intensive methods of production, succeeded in offering their services for individual craft work at a lower cost than the builder could carry it out with his own workmen. In the case of many good firms, so high a standard was normally worked to in their own shops that when they tendered for lower standards of work their workmen were not prepared to reduce their standards, and the work was of a higher quality than the price justified. For all these reasons specialist firms appeared in joinery, plumbing, plastering, painting and other trades.

In 1955, therefore, the architect has to design a building, possess knowledge covering a wide field of technology, and be familiar with methods of contracting on a scale quite unknown to his counterpart in 1900. The builder similarly has largely lost contact with the workmen, he employs them for short periods, they owe him less loyalty, and he tends to subcontract on a scale which was formerly unthought of.

Building Owners. Building owners have probably become more numerous and much more in need of widespread advice on the problems connected with their buildings. In these conditions the architect, fully to justify his position, must not only be able to design the building, but must be able to offer knowledgeable and expert advice on a large number of aspects of the building problems with which he is presented. If the profession is to secure the confidence of this widespread building public, it must show that it is capable of providing advice on a sound and reliable basis, which enables the building owner to proceed with confidence. Advice of this kind falls under a number of headings:

(1) *Financial advice.* In all periods of building, the control of costs has been difficult, but in a period where money is rapidly diminishing in value and building takes place in widely different parts of the country, both estimating and cost control have become increasingly difficult. Nevertheless, it is one of the big essentials of the building public today to know that they can set out to spend a given sum of money, and finish with a building which has cost precisely this sum. This involves accurate estimating and constant records of the cost of various types of construction and decoration. It involves on the part of the architect a power to assess the relative value of different types of construction, to know at what point he must curtail his specification, and in the early stages present costs, together with sketch plans and outline specifications, which indicate with a considerable degree of certainty the amount of money the client will have to pay for a given building. Once the estimate is given, it must be capable of being confirmed by tender or negotiated price, and it must be able to be carried to its conclusion with a similar financial position. There must be constant advice to the client as to the financial position of his completed works, and finally the work must be handed to him, if possible, at the figure at which he started.

(2) *Legal advice.* In 1900 such laws as related to buildings were of a precise and specific character. Once the law could be interpreted, it was possible to know precisely what could be done and what could not. The measure of rigidity which this created caused the members of the industry and their legislators to indulge in a large spate of permissive legislation, where controls were not precisely stated but were in the form of power given to committees to sanction works over a wide field. This change in the aspect of legislation has meant a vastly increased amount of work for the architect who controls the early stages of the scheme, an extensive knowledge of what may or may not be permitted, and the power to thread his way through this type of uncertain and difficult control. He must be able to advise his client what he can build in the first instance, and ultimately secure approval for a building which is the same as that which he put before him at the commencement of the discussion.

(3) *Technical advice.* With the growth of high tensile steel, welded structures, aluminium, patent floors of various kinds, concrete three-pin arches and complicated foundations, the field of technical knowledge has widely extended, and it is impossible today to lay down a sketch plan without an intimate knowledge of the method by which the building is to be constructed. It is also necessary for the architect to be able to give advice to his client which results in the use of the most economical and rapid construction for his particular building. This carries with it the power not only to assess the best method of construction, but to be able to give advice on the relative costs of the different methods which are possible.

Engineering Equipment. The developments in heating, ventilation, lighting and acoustics have all brought with them the necessity that the architect, in producing his sketch plans, must have a clear knowledge of the type of equipment that he is going to recommend, and at an early stage of the proposals discuss the relative advantages of different methods and their relative costs. At a very early stage in the discussion of buildings of substance, this equipment must be determined or the plan will fail to produce a structure into which it can be introduced with economy and efficiency.

Finishing Materials. With the growth in the cost of building has come the growth in the availability of alternative methods and synthetic substitutes. Over the last 20 years there have been widespread attempts to find suitable and more economical alternatives for such fundamental things as the walls of houses, surface treatment of floors, alternative types of windows and mass-manufactured doors. This involves a knowledge again of relative costs, wearing capacity and suitability.

Contracting. The manufacturing industries produce an article and put it on the market in competition with other similar articles, and the public judges the relative efficiency and value of these articles in their finally completed form. Motor-cars, radio, aeroplanes, manufactured clothing are all in this category. The only portion of the building industry which can produce a similar article is the housing section, where the speculative builder puts a house on the market on similarly competitive conditions. The rest of the industry must find a means of satisfying the public that it is paying the lowest possible price for its building, and must satisfy the industry that a young and

enterprising firm has a reasonable possibility of obtaining contracts in competition with its older and established competitors. So far the industry has devised no better means than that of the competitive tender. It is clear that as the quality and standard of building work for different buildings varies, open competitive tendering is unfair and unsound. It fails to compare like with like either in the tender period or in the finished building. Limited tendering is, therefore, essential to the well-being of the industry. Where firms have created a good reputation by the standard of their work and conduct, negotiated tenders will often produce a satisfactory answer which in many cases may be sounder and better than that of the competitive tender. But if negotiation were carried to its ultimate conclusion and tendering were eliminated there would be no basis for negotiation. The architect must know when to recommend the negotiated tender, and the assessment of the builder, and when to recommend tendering and name the firms invited to tender. Much has been said about the advisability of bringing in the builder for discussion at an early stage. In general the essentially practical character of the builder's work and organisation does not produce fruitful discussion when drawings are in a fluid state. Much more constructive results are obtained when the design is reasonably firm and working drawings are approaching completion, assuming the architect's practical knowledge to be sound.

Sub-Contracting. It is useless to consider that the industry can come back to the type of organisation which existed in 1900. The economic conditions of working today preclude any such possibility. The industry is, therefore, faced with the execution of work on the basis of a main organising and controlling contractor working with a team of specialist sub-contractors. The builder will work best if he works with sub-contractors he knows, if they are all efficient, and if they are clearly and unmistakably under his control. Fundamental sub-contractors should be appointed before the bills of quantity are complete and their names should be mentioned in the bills of quantity and the specification. So far the experience of specifying the work and leaving the builder to find the sub-contractors has too often produced firms of a low grade who are paid insufficient money to produce work which satisfies the architect and the client. In the great majority of well-thought-out buildings it is impossible to complete the drawings until the principal sub-contractors have been appointed, so that selection by the architect with or without competitive tender is essential to the completion of efficient working drawings. If reliable builders are used, it should be possible to reduce the number of sub-contracts and to make sure that at least the craft trades are included in the main contractor's work.

A great many contractors consider that the nominated sub-contractor, having been brought into the contract by the architect, will expect to act independently. They therefore fail to co-ordinate his work and they leave him as a loose member of the contract team. Many contractors fail to find out precisely where the sub-contracts start and finish, or to make sure that they have welded the sub-contractors into the time schedules, neither do they keep closely in touch with sub-contractors' material deliveries and other matters which are essential to the progress of the contract as a whole. From the architect's angle it frequently seems that the precise services which the main contractor must give to the sub-contractor are loosely defined and are unsatisfactory, frequently leading to friction. The sub-contractors have not always undertaken the full responsibilities imposed on the main contractor when the sub-contracting tenders are called for, or when the main contractor attempts to make them part of his team by calling upon them to sign an internal sub-contract. The sub-contractors frequently attach closely printed conditions to their tenders which no one reads and which they produce when any difficulty arises. There is no doubt that this looseness, lack of co-ordination and supervision are some of the main causes why some contracts do not run smoothly and do not keep to their time schedules.

Contractors' Sub-Contractors. There is frequently outspoken criticism on the part of contractors that far too much of the contract is let to nominated sub-contractors, yet it is common experience, when these nominations are omitted and the work is specified, to find the main contractor obtaining tenders from a widespread and often inferior list of sub-contractors, and to find the sub-contract placed on the basis of severe competitive tendering with sometimes a Dutch auction at the end. The architect is thus presented with sub-contractors who fail to carry out the standard of work specified, but when criticised are found to be working for sums so substantially below that of the main contractor's price that hope of securing a proper standard of workmanship is almost at an end.

The Design of Specialist Work. The history of the specialist contractor shows that early knowledge was almost entirely confined to the contracting firms. In the case of the soundest organisations this has continued to develop, so that in many cases the best combinations of technical design, practical construction and economy are found in these contracting firms. In a period of relative shortage of material, placing the design of structure with these firms has often ensured the supply of necessary materials, where working with a consultant and a subsequent contractor has created delay in building, or actual disorganisation. The complication of a modern large building is such that it can no longer be designed in its entirety within the 6 per cent fee which the public have accepted as the remuneration of the efficient architect, and in such cases it is necessary to educate the public to the fact that portions of the buildings must carry additional fees to enable them to be designed at all, e.g. the drawing of load-bearing walls on the architect's drawing takes neither more nor less time than an accurate drawing of the beams, stanchions and floors which result from the calculations of the engineer. The engineering calculations are, therefore, an additional burden on the production of the drawings. This design can be supplied by the consulting engineer or the design engineer on the staff of a contracting firm. It should be easy to devise a means by which either source of design is accepted. If the design of the contractor is accepted, the architect should ascertain the cost of the design service and treat it as a consultant's fee. The cost of steel or concrete design should be recognised and paid for by the client either in the form of a consulting engineer's fee or the design fee in the contract. This choice of the designer applies equally to schemes of heating and ventilation, and in these cases also the industry is faced with the fact that a great deal of the design ability of the country is in the hands of the personnel of leading firms of heating and ventilating engineers. The employment of specialist firms by architects clearly lends itself to abuse, as do all other forms of contracting. It is possible for an architect to have a firm of heating, ventilating or constructional engineers with whom he places his contracts, who give him a high standard of service technically, but equally charge the client a disproportionate contract sum for the contracts which are placed with the firm. The profession should, therefore, devise a means by which such abuse of advice is impossible.

Execution of the Contract. It has become the custom in this country for contracts to be based on the production of working drawings, a bill of quantity, a tender or negotiated price from a builder, supervision of the building by a clerk of works, with the over-riding control of the architect. This machine is perfectly capable of producing a well-organised contract. In practice it has been subjected to considerable criticism. Criticism arises on one hand because of a number of inefficiencies on the part of the client, architects, quantity surveyors, builders and clerks of works concerned, and on the other to the conditions of working, which in some measure are inescapable. It is desirable to start with the basis of an efficient organisation. This embraces receipt from the client of firm, unaltered instructions. What might be called professional clients should be, and frequently are, quite capable of giving these definite instructions. There are councils who are constantly building a similar sort of building, e.g. schools; development companies who are experienced in large-scale building, and certain types of factory organisations which build continuously, who may be called efficient clients. In all these cases it is still necessary for the architect to drive home to committees, boards of directors and others the serious disorganisation and cost which they incur when they change their minds

and issue confusing or conflicting instructions. With the widening of scope and amount of building, and the increasing entry into the industry of those who build single buildings, the fundamental necessity of firm, unalterable decisions has not been realised, and architects have not been strong enough or sufficiently convinced of the necessity to insist upon their clients making up their minds, approving or signing sketch plans at a given period, and leaving those drawings unaltered for the rest of the contract. This is partly a defect of the building organisations of the country and partly the failure of the architects as a profession to instil this necessity in the minds of the public.

Technical Knowledge. It is probably a deficiency of the approach of the architectural profession to the design of buildings and a weakness in professional education that far too many architects think the widespread knowledge of technical principles which they must possess is either outside their scope as artistic designers or beneath their dignity as producers of fine buildings. This is an anomaly in an age where the building of structures with false classic detail has not only ceased to be accepted as design but has become anathema to the architectural approach to buildings, and it is possible that we are seeing widespread lack of the necessary knowledge only as a passing phase.

The Quantity Surveyors. Quantity surveyors have entered the building industry in recent years with increasing force. They have built up a system of 'taking off' which is not always suitable for the work in hand, and in the case of housing is still far too elaborate and too costly. The building industry and the quantity surveyor should agree on a much simpler type of quantity surveying and a uniform system of costing which will enable builders confidently to price the same item in the same form. It is a serious burden on the industry that alterations frequently cost more in quantity surveying fees than the saving in cost to the client. The remedy quoted by some of those familiar with America is that there should be no quantity surveyors. There can be no doubt that in this instance American practice is behind British practice and in principle one set of quantities is more efficient and more satisfactory than the multiple sets of figures produced by American contractors who are tendering for the work. There has been a tendency for the architects to allow the quantity surveyors to take over too large a proportion of their work, and cases exist where the quantity surveyors write the specification, deal with the party wall awards and do other extraneous services for which the architects are paid. The profession should not allow these encroachments to take place and should insist upon carrying out the work which proper control of buildings demands.

Completed Drawings. The builder cannot possibly organise his building unless he has complete drawings and a specification. The difficulty of producing such drawings under adverse conditions has become more and more acute. The first fundamental difficulty is that of local authority approvals. Delays in securing these approvals, and securing them in a definite form, frequently run into months and sometimes into a year, and frequently for this or other reasons the building owner forces the architect and builder to commence the work within a week or two of the time at which local authority requirements are defined. The present method of giving approvals in London requires drastic overhaul, so that they are much clearer and given in a much shorter period. Without this clarification the architect is unable to give the builder clear and accurate instructions at the proper time. In default of complete drawings, such information as is available should be issued in a concise form and in the right order. With a complete grasp of the essentials of building this is possible; it should be accompanied by weekly meetings of the architect, the contractor and the relevant sub-contractors, and the issue of instructions which are as extensive and definite as the circumstances permit.

Building Organisation. There can be little doubt that the building industry as a whole has failed to adjust itself to the far more complicated organisation and administration which the sub-contract system of building has imposed upon it. Frequently its supervisors are insufficiently educated, have insufficient technical knowledge and do not take charge of the work of the sub-contractors as an essential part of their contractual obligations. Very much the same thing applies to the clerk of works. Somehow the building industry must produce many more men of a high standard of technical knowledge, of broader outlook and a greater capacity for organisation. In this field there are a number of outstanding exceptions.

Claims. One of the biggest causes of complaint of the building public is the system of claims on contracts after the work is completed. It has been the custom of builders not to disclose these claims until final accounts are rendered. This system ought to come to an end. It should be possible each month when financial statements are issued for the builder to be compelled to give notice to the architect of any work which he considers has involved additional cost, with some estimate of the amount, and this should be returned regularly to the clients so that they know how their costs are running. If the builder has not declared his additional cost in this way, he should be precluded by the contract from claiming it at a later date.

The Building Industry. Up to this point in the paper, consideration has been given to a large number of factors in the work of the architect, the consultants, the quantity surveyors and the builders as they appear from the point of view of the architect's office, but it is not outside the scope or experience of the architect to have views upon the organisation and execution of the work in the industry itself, although this aspect of the industry is more immediately within the control of the builders and contractors. If this portion of the discussion serves no purpose other than to cause the builders to criticise or endeavour to answer the criticisms raised, it will at least have served the purpose of publicising the views of an informed outsider.

Sub-Divisions of the Industry. The building industry employed pre-war approximately 1,000,000 to 1,200,000 people. It is considered today that the building and civil engineering industries combined are employing approximately 1½ million people. The industry is, therefore, the largest single industry in the country. Within this large field of employment there is clearly room for very widespread differences in skill, ability and experience, but the industry has three or possibly four main sub-divisions:

(1) Civil engineering works, i.e. roads, bridges, railways, docks and harbours.
(2) Major contracting.
(3) House building on an investment basis.
(4) Small works, jobbing and maintenance.

Although sections of the industry are interchangeable, there is a much larger measure of permanent sub-division than the public normally imagines, and in particular the maintenance section of the industry, which employs possibly one-third of the total number of building employees, is spread throughout the country. It is the section of the industry which enters people's homes and comes most closely into contact with individuals. It is, therefore, constantly subject to criticism. It would not be unfair to say that in this field there is a great lack of administration of the standard required. Maintenance and jobbing present great difficulties in the control of men when they are scattered over a wide field in groups of two and three. Nevertheless, this section of the industry spends a large amount of the public's money year by year, and it is quite essential that the small builders, foremen of works and the men who work for them should raise the standard of their efficiency and organisation considerably above the present level. Probably two main features cause the greatest amount of loss, disorganisation and criticism. The first is the ordering of materials. These materials occur in small quantities, often their precise size cannot be ascertained until existing work is opened up, but whatever the reason, it is common to find workmen arriving at houses or buildings with no material available, sometimes making a number of visits before the material arrives. The building owner experiences immense discomfort because his building is taken to pieces, and then waits appreciable periods before it can be reinstated. There is room for a very substantial increase in the standard of administration which is concerned with materials ordering.

The second is that the industry has ruled that men must receive periods in the morning and afternoon called 'tea breaks', and they have also ruled that they should arrive and depart at specified times. There is no doubt that the small builder employing 15 or 20 men in groups of one or two has an extremely difficult task in time-keeping and in the limitation of the morning and afternoon tea breaks to the expected 10 or 15 minutes. Nevertheless, it is widespread experience of building owners that time-keeping and tea-breaks represent a very low standard of morality on the part of many men, and a great deal of slackness on the part of the employers.

House Building. The house building section of the building industry is the one section which creates a building and offers it to the public when it is finished. The competition amongst individual house builders or developers is keen, the standard of article offered is generally high, and the value is often extremely good. As a whole this section of the industry appears to be very highly organised, very highly efficient, and probably produces a better house at a lower cost than its counterpart in any other country in the world. Attempts to compare the cost of house and flat building in this and other countries discloses that none can compare with those of English houses. The house builder is frequently criticised for lack of design capacity, and the houses are sometimes regarded as badly placed on site, while most architects criticise the repetition of the semi-detached dwelling which architecturally produces poor composition and bad street pictures. It does not alter the fact that the average householder requires a semi-detached house and prefers it to a terraced house, and would like a detached house if he could afford it. It is a poor answer to say that whether the householder likes it or not, he ought to be forced to live in a terraced house because architecturally it is more effective.

Building Contracting. Building contracting is the section of the industry most closely in touch with the architect, and it is the section of the industry where the architect's work is most commonly carried into execution. It is a remarkable feature of the industry that different building firms can establish a standard of work which is characteristic of the firm, and that an almost identical specification can be interpreted into quite different standards of building. It is also remarkable that the same firm can tender on a not dissimilar specification and produce one standard of building for a bank or insurance company and another standard of building for a shopkeeper. It is incumbent on the architect in inspecting and supervising the building to accept or reject building work of a standard which is appropriate to the type of client by whom he is employed, but these differences of standard exist and are recognised. It is clear, therefore, that in compiling lists of tenders the architect must exercise very sound judgement if he is to include in his tender lists builders of similar standards of quality.

Quality and Cheapness. Accepting the fact that differences of quality of building can cover a wide range of finishes and, therefore, of costs, one of the essentials of the architect in designing the building, writing the specification and choosing the builders is to know the standard of building which suits a particular client, to know how to raise the standard and how to cheapen the building when one or other is required. This resolves itself largely into a matter of experience and judgement.

Wages. Close contact with the industry shows that there is very severe negotiation when wage increases are demanded by the trade unions, but that many contractors, sometimes the largest, pay rates substantially above the agreed rates the moment settlement is reached. The industry, therefore, as a whole is faced with recruitment on the basis of low wage scales and payment of disproportionately high wages to a small section of its members. The payment of bonus on output gives rise to substantial costs in the form of measurements on the part of the contractor, and various types of compromise, satisfactory and unsatisfactory, are made to avoid the cost of measurement. This often results in labour disputes or a poor standard of work. America appears to have adopted an alternative policy of paying a high standard rate of wage and thus attracting a highly intelligent, competent and energetic man. In general this man sets out to earn the wages which he is paid. It is true that America still runs its country with a measure of unemployment, the men are faced with high earnings or something near starvation. Many of the problems of the industry would be solved if the men recruited were more intelligent, better educated, had better craft knowledge, and were paid the rate their union had agreed with the recognition for output secured or for exceptional skill.

Materials Ordering. Materials ordering reaches an extremely high standard of efficiency in a great many organisations, but in many others shortages disclose the most scrappy and casual method of obtaining scarce materials, lack of ordering with sufficient time for delivery, and other serious omissions which result in disorganisation of the work. Accurate material ordering is closely wrapped up with the provision of complete information from the architect, which is frequently lacking. It may be that if schedules of material ready for ordering were incorporated in bills of quantities, early ordering would be facilitated. I think this point should be considered by The National Federation of Building Trades Employers and the Royal Institution of Chartered Surveyors.

Protection and Lighting. When I was Director of Works at the Ministry of Works I investigated the possibility of providing better cover for men at the early stages of the contract, the possibility of more extensive lighting both of the external works and of the interior of buildings, and the provision of protective clothing. My investigations at that time convinced me that all of these provisions produced material results. It may be that an accurate and careful analysis of cost and resulting output would not show results which I appeared to secure in the war period, but I consider that in many ways conditions of work in building could be made to resemble more closely the conditions in industrial factories. This would be a larger factor in helping the building industry to recruit a better type of man.

Scaffolding and Plant. There at last appears to be a serious study of scaffolding and plant, but these portions of the equipment of buildings seem to lag behind the needs. Scaffolding ought to be able to rise in lifts of not more than a foot, so that a man is always working level with his work. The hoisting and placing of materials is showing great improvement, but still needs further study.

Site Staff. Probably the greatest single difficulty in the industry is the shortage of highly trained site supervisory staff both in numbers and in standard. Amongst a small number of the leading contractors, and in certain cases with smaller contractors and individual firms, the standard of men and the number of men employed on site supervision is beyond criticism, but in many other cases both the amount of supervision and the standard of education of the supervisors fall far below essentials and far below the standard of parallel men employed in stable factory production.

Research. All industries today regard research as vital, and most of them subsidise it substantially. The building industry is casual about its research and has not subsidised it at all. As long as this state of affairs remains, it must be a fundamental weakness. It is still difficult for the industry to know in detail the problems upon which work is in progress and properly to absorb the results established.

Education. There can be no doubt that the basis of efficiency for the architect and the builder alike is education. Sub-divided into its respective categories, it is possible to give a few leading principles which must be worked out as educational systems.

The Architect. The architect requires now, as he always did, to be an outstanding planner and designer, to have a sense of proportion, a knowledge of detail, and a high standard of taste. The medium through which these thoughts and ideas will be conveyed to other people is that of the drawing board, so that a substantial standard of draughtsmanship is still essential. No amount of technical knowledge or application must be allowed to submerge these outstanding qualities of the profession. Added to the architect's power of design must be a working knowledge of the principles of scientific construc-

tion which has now become part of building and a substantial acquaintance with all the equipment which goes into modern structures. There must be a measure of first-hand knowledge of building practice, and this can be best acquired by a period spent in a clerk of works' office or in some capacity on the building itself. Outside this technical equipment, power to grasp the cost, the implication of finance, the effect of building law, and above all, high qualities of administration are essential.

The Builder. From being a simple craft industry, building has become a complicated matter of organisation. This organisation can only be effective if it has as a background a high standard of technical knowledge so that the day-to-day administration is carried out with efficiency and intelligence. Actual training in organisation and administration can undoubtedly be of great value, and while more extensive school and university education is unquestionably necessary, nothing can take the place of practical experience which only contact with the work can produce.

The Education of the Craftsmen. It is true that the industry still looks to apprenticeship as the principal method of recruiting its craftsmen, but it is a serious blot on industry that some of its largest contractors expect other members of the industry to train their craftsmen for them. This ought to be impossible. A large amount of the craft work of building in the future will be carried out by men who need never possess more than a very moderate craft equipment. Much brickwork is laid between beams and stanchions with no corners, no reveals; much of the work of carpenters is in nailing down, centering or fixing prefabricated doors. It may be that the industry must train men who do not pretend to be fully-fledged craftsmen, and it may well be that these men are better trained in training establishments than by an attempt to train them by apprenticeship. The industry is supposed to need about 7,000 or 8,000 more men per annum than it trains. It will never be efficient so long as this remains true.

The Craftsmen. It is useless to continue to complain of poor craftsmen unless the industry ensures that each year it has trained at least sufficient men to make up the wastage which normally occurs. It is questionable whether training today is best carried out entirely through apprenticeship. Either the industry or the State or both must produce training schools for craftsmen which are sufficient to cope with the supply of craftsmen which the industry must have.

Summary. To reach the standard of efficiency which the public demands from the profession, essential qualifications may be summarised.

(1) In every architect's office it is necessary to have

(i) a high standard of planning and design;

(ii) a knowledge of decoration and colour;

(iii) an extensive knowledge of construction, especially of the basic principles which involve choice of method, optimum spans and relative costs;

(iv) a knowledge of the principles which govern the engineering equipment of buildings in connection with heating, lighting, ventilation, acoustics and other essentials;

(v) a wide knowledge of materials, including synthetic substitutes and suitability of application;

(vi) a knowledge of the legislation which governs planning and building;

(vii) a command of the means of dealing with sub-contracts and the administration of the main contract;

(viii) an appreciation of cost;

(ix) ability to supervise and control work in progress.

(2) The profession must ensure that it constructs and retains

(i) a comprehensive system of day and evening education with a wide choice of method. All educational courses to have a proper balance between artistic and practical subjects;

(ii) the provision of adequate teachers and professors all having practical experience;

(iii) a live organisation which constantly reviews the progress of construction and design and the best methods of administering contracts;

(iv) establishes conferences which ensure the principle of co-ordination between the architect, consulting engineer, quantity surveyor, contractor and sub-contractor;

(v) regular exhibitions which present world architecture and construction to the profession.

The Client. The training and education of the public to appreciate the work which is done by the architect and ensure that clients as individuals, boards or committees are fully conscious of the part they must play in successful building.

The Press. A live Press constructively critical. A Press which constantly analyses alternative methods of building, methods of administration of contracts, and covers a wide field of information embracing all factors in modern building.

MR. WOODBINE PARISH

SIR THOMAS BENNETT has outlined in his paper certain features of the evolution and development of the building industry since the turn of the century, and has shown in some detail the change in pattern and resulting problems which now require urgent joint examination and solution by the industry's various leaders. This paper sets out to focus attention upon the administrative organisation and chain of command by which building needs are translated into productive action and the complicated mechanism of management that exists within the industry at the present time to achieve this end.

The general layout and body of personnel constituting the building industry are highly complex, but sufficiently well known and understood to make an elaborate recital redundant. A full knowledge and realisation of the general structure and detailed anatomy of the building and allied industries and the division of their various related and interrelated management functions are essential, however, to enable both architect and builder to ensure the competent conduct and smooth progress of building work. There is nothing novel about the function of management, it has been practised throughout the world since the earliest days of mankind, but its full importance as a major factor contributing to industrial stability and a high level of productivity has not always been comprehended.

These essential management functions in the constructional industries are not as clearly recognised or understood as they should be and they are seldom defined in precise terms. This lack of managerial precision and planning is one of the main causes of much of the adverse criticism so frequently levelled at those engaged in building.

The Pattern of the Building Industry. Within the building industry there are three main groups: the professional group embracing the architects, who with their specialist consultants are concerned with the planning, design and general direction of building work, assisted by quantity surveyors in the technical auditing and accounting functions; the industrial group, covering building trades employers and sub-contractors, their craftsmen, technicians and other grades collectively concerned with organising and conducting the main construction and assembly processes; and the commercial group embodying the producers, suppliers and distributors of building materials and components.

In addition to these three main groups there are various ancillary groups directly and indirectly in part and in whole concerned with inter alia the administration of central and local government regulations and controls affecting the industry; the provision of educational facilities; the conduct of research into the uses of building materials and the development of methods and techniques; the manufacture and

renting of builders' plant and equipment; the provision of the several public utility services; to mention but a few. All these fragmented and diverse elements must be recognised as collectively forming the indivisible building industry.

Co-ordination of the Building Team. On each building project the personnel of the main groups require to be carefully co-ordinated and their work assigned, integrated and programmed so as to achieve an efficient and contented building team. The whole process of building needs to be continuously and competently evaluated and directed from top level by a single individual who can initiate, inspire and control all aspects of a building scheme from start to finish, delegating and devolving responsibility as and when necessary to the various members and levels of the building team but always maintaining a close direction and general surveillance of the total progress of the work.

Architecture, when the word is interpreted as meaning the work of the architect, is not an end in itself, it is but a fundamental part of the whole process of building. Good building may be defined as the detailed planning, design and assembly of a wide range of materials and components of various kinds into forms which are at once appropriate to particular conditions and needs as well as being aesthetically agreeable. This process of assembly is achieved by the accumulated skill and effort of many individuals in varying degrees of association, but all collectively forming a team with a common aim in view.

The Role of the Architect. Every association of individuals in any enterprise or field of activity needs a principal or leader at its head to ensure a successful organisation. The titular head of the polygamous building team, by tradition and calling, is indisputably the architect, whose responsibilities are certainly manifold but not always manifest. The role of an architect may be defined as twofold. Primarily by training and inclination he is a creative artist. Sequentially and too often in temperamental contradistinction, he is necessarily a top-level business executive, inescapably responsible for initiating and directing the construction of his own designs. In this latter responsibility the architect should be able to rely completely and confidently upon the integrity and organising ability of each builder with whom he associates: while the builder, for his part, should be assured that the architect will provide complete information and concise instructions in relation to his clients' needs, in such a form and sufficiently in advance of actual construction that he has reasonable opportunity, economically and efficiently, to organise and co-ordinate the work of his own staff and that of sub-contractors. The builder also should be able to anticipate that the forms of contract, so far as payment and other relevant matters are concerned, are administered by the architect in a just and business-like manner.

To understand clearly the full scope of the architect's managerial responsibility, it is necessary to appreciate the impact that recent social and economic changes have had upon the pattern and development of relations within industry and commerce. The Industrial Revolution substantially altered the character of many industries, but curiously brought no major innovation to the long-established methods and practices of the building industry in this or any other European country. It is only within the past half-century that there has been any substantial change in the technical and industrial mosaic of building. Some of these changes have been referred to in Sir Thomas Bennett's paper and their impact upon the policy and practice of building management must now be carefully analysed and noted.

The Need for Unified Command. Contrary to public opinion, which is so often misled, the building industry contains many well-trained and widely experienced architects. There are untold numbers of builders and specialists, small, medium and large, well organised and equipped to undertake the ubiquitous building and maintenance requirements of the community. In the ranks of the building workers can be found some of the finest and most highly skilled foremen and craftsmen of any industry in the country. The merchants and distributors of materials have established and maintain an efficient service to the industry. It must be obvious that to be fully effective these several forces with their separate functions and immense potential capacity need to be brought closely together under a unified command.

Unlike most manufacturing industries, in building the primary management function is divided between the architect who is responsible for design and the general direction of building work, and the builder who is the architect's managing agent, responsible for the general organisation and administration and construction, to which is added the burden of the financial and commercial risks involved in undertaking building work. These two essentially complementary functions are regrettably, under current circumstances, kept entirely separate until a very late stage in the planning and development of most building projects, and as a result are extremely difficult to correlate completely. It is therefore of cardinal importance that while the industry's present casual and often fortuitous system of tendering and awarding contracts exists, the basic principles of general management should be far better understood and practised by architects and all engaged under their direction, so that the level of managerial skill may be raised to that of the very high standards now existing in certain sections of industry in this country.

The Nature of Management. Much of the prevalent thought upon the subject of building management seems to be misconceived and misdirected because of the confusion between the tasks of management and the techniques of management. The confusion, which is due to an inadequate and narrow outlook on the matter, has led to dangerous assumptions, and it is therefore important to have the distinction between the task and the technique clarified. Defined in the simplest terms, the task or strategy of management is to bring about conditions under which the work of a team can come quickly and economically to good effect in the achievement of some co-operative objective. It will be realised that this definition applies to all levels and aspects of management including top-line, middle and supervisory grades, whether they be in the professional, industrial or commercial groups, jointly or severally concerned. The definition is in no way affected by the magnitude or exiguity of an undertaking or project.

The paramount task of management is to determine policy and formulate procedure, so as to establish a wholesome atmosphere in which a high standard of morale can be consistently sustained at all levels in the conduct of building operations. This feature of management in industry profoundly affects the whole range of human feeling and experience, but so often it fails to excite the interest of architects and builders and therefore enjoys little priority in their direction and conduct of building work.

The techniques or tactics of management, on the other hand, are the many detailed practices and methods of operation which each individual must master and be able to use effectively if he is to be successful in the general or specialised functions of management, be they primary, secondary or residual responsibilities.

The Importance of Human Relations. It must be obvious that everyone who is responsible for directing the productive work of others must be fully competent and knowledgeable, or alternatively well advised in the particular field or process which he is directing, but the best of his skill will inevitably be dissipated if he is unable to manage other people, command their respect and bring the best out of each member of the team that he leads. Results are only achieved through people, and this basic human fact, too often ignored, must be uppermost in the mind of every architect and builder when he has a management responsibility to perform. Working through people in this sense entails considerably more than the vague generalisation that is normally in the minds of people who loosely refer to 'management', because in order to manage or direct a team upon any building project and to enable it to operate at its maximum effectiveness, the individual responsible for managing it must be able to work happily and confidently with everyone, be he client, builder, consultant or any other member of the building team.

Enlightened top-level management involves very much more than the simple

ability to be agreeable, although courtesy and self-discipline are of the greatest moment. It is fundamental that there is a dynamic and intelligent appreciation of the separate role of each individual or group concerned in a joint venture and a capacity for establishing mutual respect and enthusiastic co-operation as well as an ability completely to control any unforeseen situation that may arise. It is significant that well trained foremen and craftsmen quickly detect a lack of managerial ability in an architect, and it is difficult, and often impossible, to ensure that respect and co-operation will not languish when indifferent or cavalier direction is experienced.

The Significance of Planned Management. The wide range of clients and building requirements, the diverse circumstances and conditions under which work is executed, the different character and size of organisation, the varying degree of interdependence and inter-responsibility of the several partners in the building team, all tend to confuse the basic managerial issues. Until the full significance and importance of planned management in building is more fully appreciated and better understood, particularly at the top level of industry, it is doubtful whether many of the burning problems such as future architectural and building educational policy; the recruitment and training of adequate and suitable entrants to the crafts and supervisory grades; the improvement of tendering and contract procedure; the introduction of better budgetary control; the reduction of building costs; improved productivity; the development of work and method study; the greater use of mechanical plant; the better application of the results of research, can be more than tampered with. The architectural profession, trained to analyse and resolve the requirements of building owners, should not find it difficult, with the practical experience of builders, carefully to analyse and plan in detail the optimum pattern of management by which building can be more economically and successfully conducted. The British Institute of Management, with its wealth of factual experience in management practices covering a wide field of industry and commerce, could undoubtedly make a valuable contribution to any joint discussions that are initiated.

It is a grave reflection on the whole industry that although the management aspect of building work has received considerable notice and comment during the last decade, there is little cause for extravagant hopes of any major change of outlook developing in the immediate future unless some specific research is initiated without delay. The recommendations contained in the Simon Committee Report on the placing and management of building contracts, the report of the Working Party on the Building Industry, the report of the Anglo-American Productivity Team on building and the more recent report of the Joint Committee on tendering procedure set up under the chairmanship of your distinguished immediate Past President, are all signposts to action. Unhappily many of the recommendations go unheeded, for although there is universal agreement upon the need for improved management in the building industry, there has been no significant united move to date to examine in detail or to analyse the complex field of management activities in the industry, with a view to establishing an acceptable 'Code of Management Practice for Building Work.'

The Apparatus of Management. Management can be broadly translated as meaning the whole range of functions that are brought to bear upon solving the problems involved in transforming needs into constructive and productive action. So far as building is concerned, the architect is inescapably involved in the management function from the moment that he is appointed by the building owner until the settlement of the final accounts, and his responsibilities may well extend far beyond that period of time. The production of client requirement questionnaires, plans, designs, specifications, bills of quantities, schedules, work programmes, forms of contract and sub-contract, are not final objectives, they are purely incidental instruments to achieve productive action. They are part of the whole apparatus by which general and detailed instructions are conveyed through a whole series of individuals to achieve actual building.

The chain of command starts with those who instigate at the top and goes right down to those who ultimately respond by mental and physical productive action. In building there are various chains of command, some short, some long; most are interlinked at certain points. All who form part of these various chains collectively comprise a complex group with varying degrees of contact and association with differing levels of authority and responsibility in their specialised fields. All need specific and enlightened direction from top level and co-ordinated integration within a carefully determined and detailed management plan.

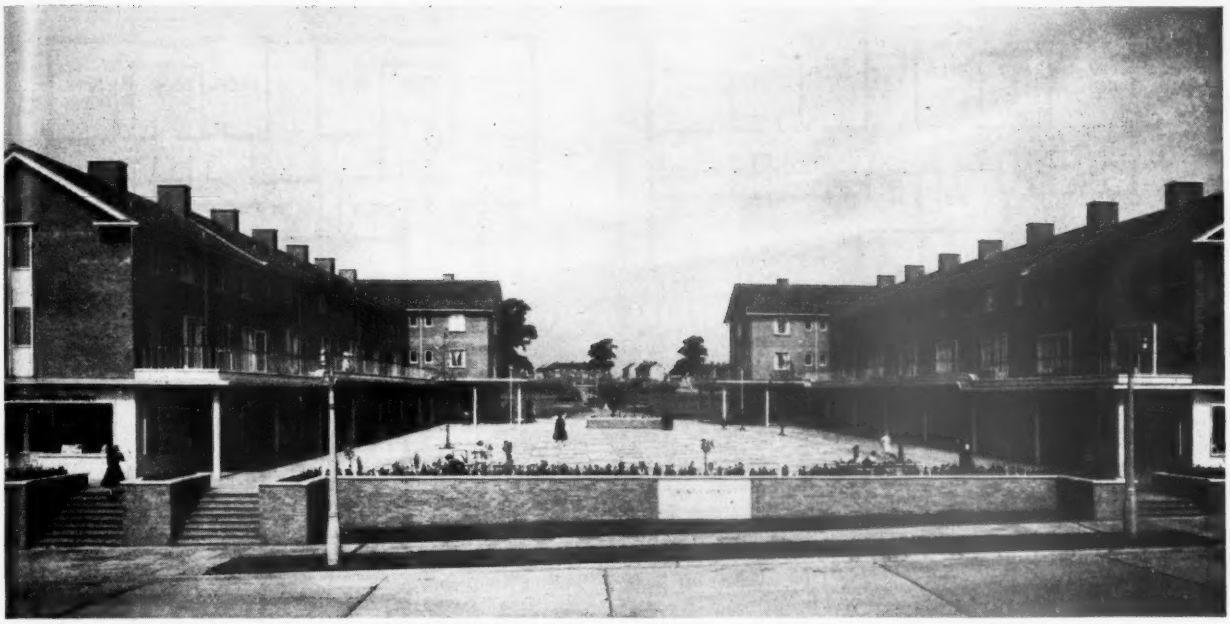
The Division of Functions. It may be arguable whether one has the right to waste one's own time. There can be no possible justification for wasting the time and energy of other members of a team. Such waste is unavoidable when insufficient thought is directed towards the mechanics of management. To enable any association of individuals to operate continuously at maximum effectiveness, it is necessary for a clearly defined policy to be determined at top level, with principles and procedure concisely laid down to give formal effect to such policy, so that everyone concerned has a lucid realisation of his particular role.

The administrative and operational procedures may with advantage be set out upon an organisational chart indicating the general structure and division of management functions on each building project, showing the various individuals concerned, their functions, their levels of responsibility and authority and their varied interrelated contacts.

The practice of regular minuted meetings with frequent review of progress by both the architect and builder are the sole means of ensuring the necessary degree of flexibility and smooth flow of work by assessing and forecasting short, middle and long term work programmes and checking actual results. The establishment of sound lines of communication and response between top level management and everyone concerned on a building is a vital factor in the direction and control of the process of assembly, and needs to be considerably developed in the future. Too often there is evidence of failure to keep everyone advised of the general picture, and this invariably leads to discord and counter-action which militate against the streamlining of work programmes. It is not an exaggeration to say that the success or failure of a building project is, with few exceptions, a direct reflection upon the ability of the architect to exercise his responsibility in choosing with infinite care the various members who are to form each building team. This selection unhappily is far too often quite fortuitous and haphazard and not infrequently results in low individual performance, and consequent disappointment and frustration for other members of the team.

The importance of complete mutual trust and respect between client, architect and builder, and also between builder and craft worker, cannot be over-emphasised, for they are the very foundations upon which the whole organisation of good building depends. The elusiveness of these fundamental human qualities is the pre-eminent current dilemma facing the building industry and there can be no doubt that a marked improvement in the standards of management practice could achieve substantial reduction in building costs and a greater satisfaction for those engaged in a great and noble industry.

The Conference may wish to discuss the advisability of setting up a Study Group to examine the whole question of management practices with a view to establishing a Code of Management Practice applicable to the broad needs of the industry. It might be appropriate for the question of closer collaboration between architect and builder in the field of training and education to be discussed so that a common approach to management problems might be developed in the several syllabuses at schools of both architecture and building. The future of building depends more upon the ability of the industry to recognise fully the fundamental importance of improved management than upon any other single factor. It would be a grave misfortune indeed if this, possibly unique, occasion were to be allowed to pass without setting under way at least a pilot study of the mechanics of building organisation and management with a view to introducing suitable training and practices.



General view of the shopping centre, looking towards the park

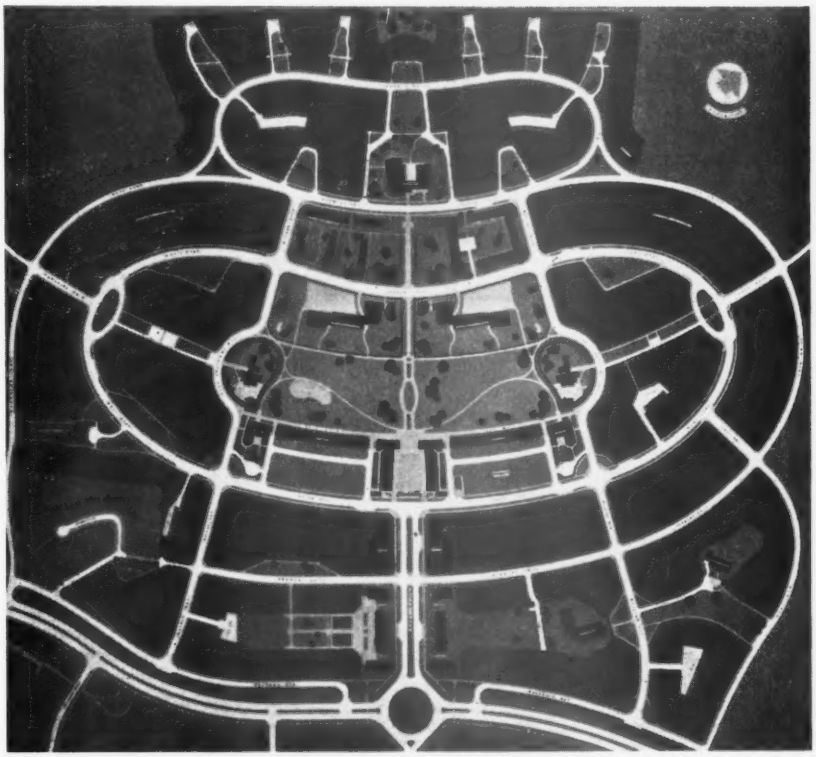
King's Heath Shopping Centre, Northampton

Architect: J. L. Womersley, A.M.T.P.I.[*A*].

THIS shopping centre was designed by Mr. Womersley when he was Borough Architect of Northampton and it was awarded the Architecture Bronze Medal for the three years ending 31 December 1953 in the area of the Northamptonshire, Bedfordshire and Huntingdonshire Association of Architects. The centre forms part of a pedestrian sanctuary in the heart of the King's Heath neighbourhood which, when complete, will accommodate a population of some 5,000 persons in 1,400 dwellings.

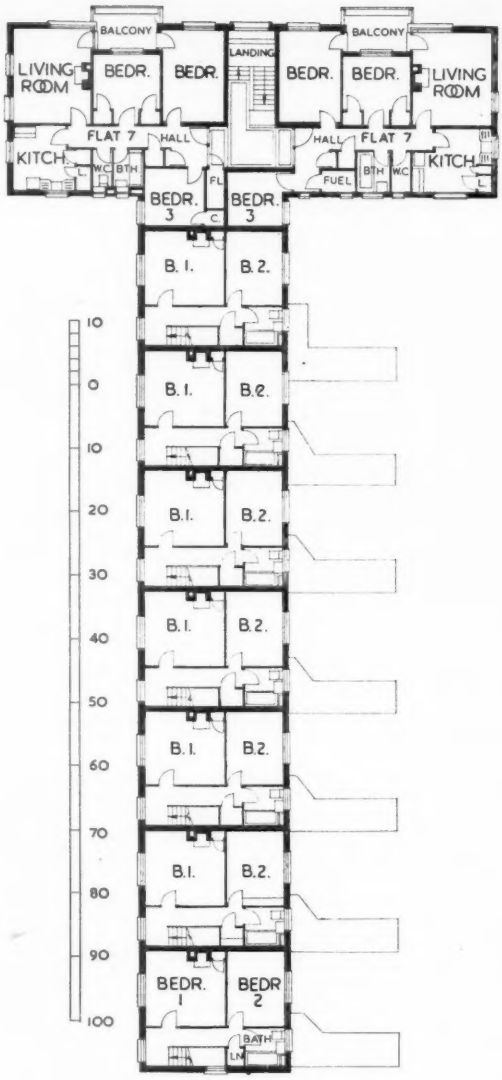
King's Heath estate is situated a mile or so from Northampton and is served by a frequent bus service from the town. This influenced the siting of the shopping centre, for it was felt that if the inhabitants of the estate were not able to buy what they wanted at their local shopping centre they would be more inclined to make their way to the town itself rather than go outwards to make their purchases. The shopping centre has therefore been placed somewhat on the Northampton side of the neighbourhood centre so that persons would be moving towards the town and would not be wasting much time in case they were not able to satisfy their requirements locally. Buses pass the end of the centre.

These considerations also affected the number of shops to be built and it was finally decided to restrict them to sixteen, which is much less than the average of general recommendations in relation to the number of dwellings served, but the view was taken that it was better to have too few busy shops rather than too many half empty ones; in any case it would be possible



Map showing the layout of King's Heath estate. The shopping centre is situated on the southern curve of the inner ring road

The lower floor plans of the maisonettes on the north-eastern side



The upper floor plans on the north-eastern side

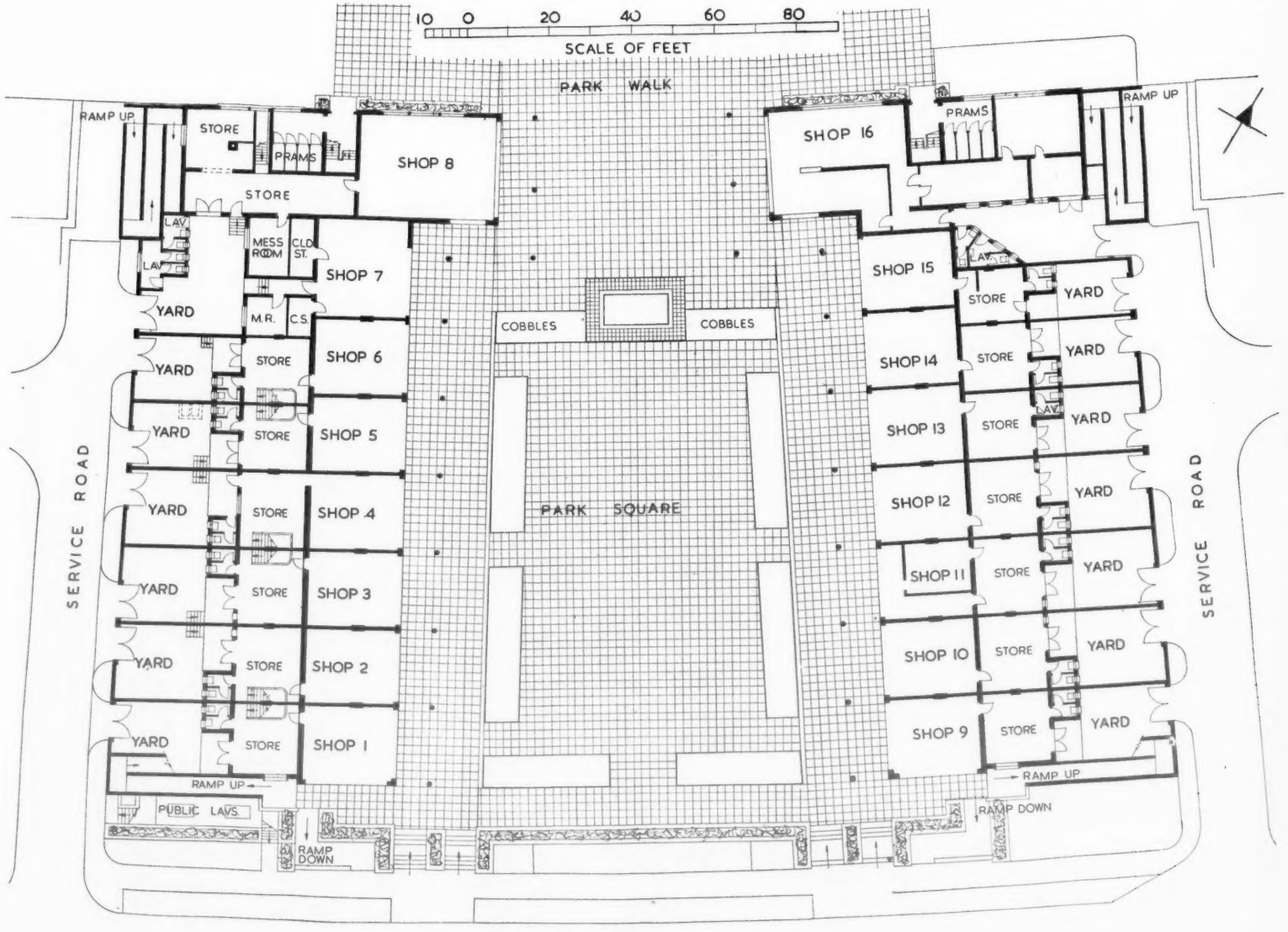
to build two additional groups of four shops each, if at any time it should become desirable.

The shops have been planned on either side of a paved area, called Park Square, as it was thought that this arrangement would create a greater sense of intimacy than if they were strung out in a long line bordering on the adjacent park, and persons would be more likely to pass from one shop to another. Footpaths through the park converge on the centre.

The centre lies to the south of the park and is about 164 ft. long and 64 ft. wide at the park end, opening out to approximately 120 ft. at the other end; there is a fall in the paved area of some 2 ft. 6 in. from the park end. The floor levels of the shops on each side fall in 3 in. jumps but the corresponding opposing shops on each side have the same floor levels. On each side of the square a colonnade 8 ft. 6 in. wide extends in front of the shops, supported on columns at 19 ft. centres; thus shoppers are protected from the weather. Pavement lights cast in the canopies help in giving light to the shop fronts.

The shops have a storage room and lavatory giving on to a yard having access from a service road at the rear, so delivery vehicles can be backed in and the goods unloaded without inconvenience to the shoppers, an arrangement that was welcomed by the Chamber of Trade. On the south-west side of the centre the shops have basement storage in addition to that on the ground floor.

Over the fourteen shops that flank the square, 2-storey maisonettes have been built; these have been designed almost exactly like the normal 2-storey houses on the estate. Access to them is by means of ramps at each end of the centre; they have an average gradient of 1 in 10 and special attention has been paid to their architectural treatment. The ramps lead to access balconies at the rear of the maisonettes, extending over the shop lavatories beneath. Between the access balconies and the back walls of the maisonettes there are garden courts and these, with the balconies provided by the colonnade canopies, enable



Plan of the shopping centre at ground level. The ramps up to the maisonettes over the shops are at each of the external corners. The park lies to the north of the centre

View of the north-eastern side, taken from the road

The shopping centre, looking from the park

prams to be put out in the sun at all times of the day.

The prams are the reason why access ramps are provided instead of steps; ramps also make for easier fuel delivery and refuse collection. Fuel stores are provided in the garden courts and also L-shaped flower boxes. Flower boxes run along the front edge of the canopy balconies facing the square on each side.

Owing to the differing aspects of the two sides of the shopping centre the planning of the maisonettes on one side is different from that on the other, but the floor space is the same. On the north-east side the living-room faces the square, to catch the sun, with the kitchen and hall behind; on the other side a dining-room and kitchen face the square and the living-room and hall are at the back, overlooking the garden court. On the upper floor there are two bedrooms and a combined bathroom and w.c.

As will be seen from the accompanying plans the two shops at the northern end break forward, and over these and the adjoining pram spaces eight flats have been built, six having three bedrooms and two having two bedrooms.

They are approached from a central staircase on each side, facing the park, but on the first floor they can be reached from the ramps and access balconies, from which spurs lead to the staircase landing. The kitchens are generous in size and could well serve as dining-kitchens. The w.c.s are separate from the bathrooms. Each flat has a balcony overlooking the park. There is a fireplace in each living-room, and this applies also to the maisonettes.

The general construction is in load-bearing brickwork, with reinforced concrete columns, beams and canopies to the shops. The floor and the flat roofs over the stores are of reinforced concrete. Timber roofs cover the maisonettes and flats, finished with clay pantiles. The party walls and the external brick walls are of cavity type, the facing bricks being Ibstock golden brown hand-made sandstocks. The exposed concrete is finished with reconstructed stone facings to match the window surrounds. The shop fronts are in aluminium.

The King's Heath estate includes a cinema and clinic buildings, but these have been sited away from the shops, as it was felt to be important to build all central area shops at one time and as quickly as possible, so that the needs of the inhabitants could be met and the business focal point of the estate completed. Sites for an infants' school, community centre and nursery school are also located near the shopping centre and these, with the park, complete the pedestrian sanctuary. It was considered to be an advantage to group the communal buildings and sites together, on the principle that persons who are attracted to one particular building or groups of buildings will be likely to use the others.

Mr. Womersley was assisted by his then deputy, Mr. Geoffrey Hopkinson [*A*] and Mr. P. C. R. Bryan (*Student*) and he pays due acknowledgements to his Clerk of Works.

Review of Construction and Materials

This section gives technical and general information. The following bodies deal with specialised branches of research and will willingly answer inquiries.

The Director, The Building Research Station, Garston, near Watford, Herts. Telephone: Garston 2246.

The Officer-in-charge, The Building Research Station Scottish Laboratory, Thorntonhall, near Glasgow. Telephone: Busby 1171.

The Director, The Forest Products Research Laboratory, Princes Risborough, Bucks. Telephone: Princes Risborough 101.

The Director, The British Standards Institution, 2 Park Street, London, W.1. Telephone: Mayfair 9000.

The Director, The Building Centre, 26 Store Street, Tottenham Court Road, London, W.C.1. Telephone: Museum 5400 (10 lines).

The Director, The Scottish Building Centre, 425–7 Sauchiehall Street, Glasgow, C.2. Telephone: Douglas 0372.

Meals in Modern Homes. It has been said that houses, or at least kitchens, should be designed by women architects, since they know the running of a household and what work has to be done in the kitchen. Without arguing that debatable point it can hardly be questioned that the person best qualified to comment on the arrangement of a kitchen is the housewife who has to use it, and therefore *Meals in Modern Homes* makes interesting reading.

This booklet has been prepared by the Council of Scientific Management in the Home and it records the result of a study made with the co-operation of local authorities amongst housewives living in houses and flats built between 1945 and 1952 in various parts of the United Kingdom. Five hundred and fifty-eight urban and 196 rural housewives were asked to fill in questionnaires regarding their preparations for meals and their views on the planning of the kitchen and the arrangement of the appliances.

Of 24 housewives who have kitchens of between 69 and 100 sq. ft., eight said their kitchens were too small; none with larger kitchens made that comment, and the general opinion was that the space free from fixed equipment should be square rather than oblong. The Council consider about 6 sq. ft. for the larder in urban districts is desirable, instead of the officially recommended minimum of 4 sq. ft.; for rural areas a minimum of 10 sq. ft. seems satisfactory. In some houses visited, hot pipes passed through the larder, a practice which the Council appear to view with some amount of disapproval!

The booklet can be obtained from the Council, 26 Bedford Square, London, W.C.1, price 5*s.* 3*d.* post free. Read in conjunction with the article on 'The House and Housework,' in the December 1954 JOURNAL, it should give a useful guide to an architect, male or female, when designing a kitchen.

Metal Door Frames. The Metal Window Association Ltd. announce the introduction of an alternative range of standard metal door frames for housing, in 18-gauge sheet steel. Except for the thickness of sheet the sizes, fittings, finish and specification will be the same as in the existing standard range of 16-gauge frames, but prices will be lower.

The Association state that the introduction of this new range follows prolonged tests and experiments with 16-gauge frames and is in accordance with current practice in the U.S.A.

Gauge 16 represents a thickness of 0·06 in. Birmingham gauge, and gauge 18 represents 0·04 in.

Building Bulletin No. 11. The Ministry of Education have issued their Bulletin No. 11, dated April 1955, dealing with the design of school kitchens and intended for the guidance of local authorities and architects. The bulletin points out that during the last war canteens were added to a great number of existing schools, these kitchens and dining-rooms being housed in standard Ministry of Works huts, and though they made a substantial contribution towards meeting urgent needs their drawbacks have become increasingly obvious.

Following a rigorous scrutiny of the real functions and needs of a school kitchen, the bulletin has been written to set out certain broad principles governing the design, construction and organisation of kitchens, but the plans and diagrams illustrating these principles are not meant to be taken as standard plans, nor are the areas recommended for each size of kitchen intended to be regulation areas, they are 'presented as incentives to the architect to help him achieve the maximum value within the current limits of cost per place'.

In addition to planning diagrams, based on a non-grid, 3 ft. 4 in. grid and 8 ft. 3in. grid, there are useful illustrations of various articles of equipment, and appendix No. 2 gives a table of main equipment, storage and staff accommodation.

The bulletin can be obtained from H.M.S.O., S.O. Code No. 27–291–11, price 3*s.* net.

Domestic Electrical Appliances. At the request of the Ministry of Fuel and Power the British Electrical Development Association have compiled List No. 3, January 1955, being a list of tested and approved domestic electrical appliances for local authority housing. The list cancels List No. 2, January 1954, and may be obtained from B.E.D.A., 2 Savoy Hill, London, W.C.2, free to those officially concerned with housing.

Homes for Old People. The Ministry of Health have published their Circular 3/55, dealing with residential accommodation and homes for the more infirm; it is addressed to local authorities and is issued because 'it is generally recognised that the type of old person for whom residential accommodation under the National Assistance Act is needed is nowadays found increasingly to be the very infirm person often requiring periods of care in bed'. The Ministry have reached the conclusion that in heavily populated areas where considerable numbers of old people have to be provided for and where suitable sites are difficult to find it may be reasonable to build homes of up to about 60 places.

The circular contains a suggested design for a home to house 60 old people of both sexes, and an appendix giving standards of accommodation. Obtainable from H.M.S.O., price 9d. net.

Plastering Contractors. The National Federation of Plastering Contractors, a body affiliated to the N.F.B.T.E., is setting up a panel of its members in each region to give talks or hold discussions on matters relating to the plastering trade. Where subjects relating to the plastering craft are to be discussed these panels are prepared to provide speakers.

The Timber Development Association. At a luncheon held on 19 May to celebrate the twenty-first birthday of the Timber Development Association, the President, the Earl of Faversham, D.S.O., D.L., announced the establishment by the Association of a research organisation. While the Association would continue to collaborate fully with the Forest Products Research Laboratory, he said, their new research organisation would specialise in user research. A short film was shown of which the chief feature was the use of timber for structural framework to cover wide spans.

Symposium on Winter Concreting. The Danish National Institute of Building Research announce that a symposium on the theory and practice of concreting in winter will be held at Copenhagen, from 12 to 18 February 1956. The tentative agenda includes addresses on definitions and characteristics of weather conditions in winter, laboratory experiments on the resistance of concrete to early freezing, hardening of concrete as influenced by temperature, obtainment of high quality concrete, and winter concreting on the site. There will also be visits to jobs under construction.

Everybody possessing relevant and hitherto unpublished information which cannot be properly presented orally in a 5 to 10 minute address, or on which other members cannot comment at short notice, is invited to submit written contributions in English, French or German.

Inquiries should be addressed to the Organising Secretary, Rilem Symposium 1956, c/o The Danish National Institute of Building Research, 20 Borgergade, Copenhagen, K, Denmark.

Arcon Development Group. On 21 April the Arcon Development Group held their 100th monthly meeting. It would therefore be correct, but quite misleading, to refer to the event as the centenary of the Group; misleading, because in connection with living persons the word centenary suggests senility and a weakening of physical and mental activities, an impression entirely untrue of this vigorous and imaginative Group. The Group first came together in 1943 and now includes Imperial Chemical Industries, Stewarts and Lloyds, Williams and Williams, the United Steel Companies, and Taylor Woodrow (Building Exports). The architectural consultants are Mr. A. M. Gear [*F*] and Mr. R. M. Thomas [*A*].

This combination of skill, experience, and financial and manufacturing resources has enabled the Group to design, manufacture, deliver and erect buildings, especially abroad, with a speed difficult to achieve by isolated activities. Since 1948 Arcon structures providing a coverage of 15 million sq. ft. have been exported to 80 countries, and this year exports have been at the rate of 150,000 sq. ft. of coverage a month. Especially has this combination permitted the Group to devote time and money to research and experiment aimed at the production not only of complete structures but also of building components which will fit together to form the desired building.

At the centenary occasion the Press were given the opportunity of visiting the offices of Mr. Gear and Mr. Thomas to see some of these experimental ideas transformed into models and prototypes which can be pondered over and tested for any possible 'snags' before being put into practice.

As the architectural element enters so definitely into the work of the Group it was fitting that the Chairman, Mr. W. F. Lutyens—a relative of Sir Edwin—should preside over the luncheon held to celebrate the centenary meeting.

Fire Research. The Fire Research Board have presented their report for the year 1954 to the Lords of the Committee of the Privy Council for Scientific and Industrial Research, and the Fire Offices' Committee. Complete statistics for 1954 are not yet available, but the number of fires attended by fire brigades in the United Kingdom is known to have been approximately 84,000.

It is perhaps natural to think of a fire as originating from an ignition source within a building, but tests made with scale-model rooms exposed to radiation up to 25 minutes showed that with a window opening of 100 per cent the furniture was ignited before the fibre insulating board lining of the walls, but with a window opening 33⅓ per cent the ignition of the wall linings was the determining factor, and a graph shows the minimum separation between two buildings to prevent spread of fire, on the basis of three percentages of window opening. The performance of roofs exposed to heat radiation from a nearby fire has also been studied. Investigations into the spread of fire externally on buildings, made on a 2-storey model, showed that only when there was neither a horizontal projection such as a balcony nor a 3 ft. vertical separation between the openings in the two rooms did the flames from the lower room cause ignition in the upper room.

At a recent exhibition at the Fire Research Station, Boreham Wood, the appliances for these and other tests were shown and explained. The results of tests on the fire resistance of concrete beams with post-tensioned steel and the effect of high temperature on the crushing strength of concrete will be of great value. An interesting exhibit was the apparatus for estimating the fire resistance of a new type of structure by means of an electrical analogue technique, based on the established laws of heat conduction.

The Colt Two-way Fan. The general conception of a ventilating fan is that it devotes itself to one single-minded aim, that of pushing air in one direction, and this is what it does when mounted with its vanes parallel to a window pane, or at right-angles to the axis of a duct; it would therefore seem unlikely that it could be made to draw in fresh air to a room and at the same time to expel the vitiated atmosphere. But this is what Messrs. Colt have achieved, by the simple process of mounting the fan at right-angles to the usual position in a window so that the vanes on their outward revolution (so to speak) draw out the air from the room and on their inward movement draw air from outside and push it into the room. As the amount of air extracted is equal to that drawn in there is no tendency to pull air from under doors, and thus no draughts are caused.

The first criticism that occurs to the mind is that the opposing currents of air near the fan would short-circuit the system, but horizontal baffles guard against this possibility, and Messrs. Colt say that in fact it does not occur. On test a 12 in. fan gave a net effective rate of air change of 4,140 cu. ft. per hour.

The fan is powered by a small electric motor, 1 phase 50 cycles 25/26 watts input, and is manufactured by Messrs. Colt Ventilation Ltd., of Surbiton, Surrey.

Asbestospray. Messrs. William Kenyon & Sons Ltd., of Chapel Field Works, Dukinfield, Cheshire, have issued particulars of their Asbestospray, which is composed of mineral fibres and binder with air and water sprayed by a special technique on to any rigid surface, be it metal, brick, concrete, plastic, wood, stone, or metal lath. The result is 'a blanket-like surface containing a multitude of minute air pockets which entrap and absorb sound vibrations and form a highly efficient barrier to thermal transmission'.

When treating metal and asbestos cement a rubber-based adhesive is normally applied, and this and Asbestospray serve to protect metal from rust and corrosion. For fire protection the results of laboratory tests are good; under the time-temperature-curve a 2 in. thickness gave a steel beam a 2½ hours' resistance.

The Modular Catalogue. The Modular Society have now produced the third issue of the Modular Catalogue, being sheet No. 14, Thermagard system of construction; sheet No. 15, Messrs. Baldwin's precast concrete flooring units, and sheet No. 16, Mazda module lighting equipment. An amended sheet No. 8 is also issued.

Module Lighting Fittings. The British Thomson-Houston Company, Ltd. of Crown House, Aldwych, London, W.C.2, announce the introduction of a new series of recessed lighting fittings which they have named Module fittings. They are made 'to dimensions acceptable to the building industry, the aim being to eliminate the past policy of cutting to waste where a building component, such as a ceiling panel, meets another, such as a lighting fitting'.

These Mazda Module fittings are made in three sizes, 2 ft. by 2 ft., 2 ft. by 4 ft. and 2 ft. by 6 ft. and are interchangeable with standard 2 ft. by 2 ft. or 2 ft. by 1 ft. ceiling panels. They can be installed in a standard suspended ceiling in any desired arrangement, and they will not overlap as they are suspended independently of the false ceiling.

The fittings may be seen at the 'Lighting and the Architect' exhibition now on view at Crown House, Aldwych; it will remain open until about the end of August.

The Brentford Duo-therm Heat Pump. In the April 1954 JOURNAL a description was given of the first production model of the Brentford Duo-therm Domestic heat pump. The makers now announce the mass-production model Mark II, which embodies added refinements.

The following are some of the points of the new model: refrigerator capacity, 2½ cu. ft., with ice-making facilities; cool storage for compartment of about 120 cu. ft. at 40 degrees F.; hot water, 120 gallons a day at 140 degrees F. from 30-gallon tank; linen cupboard warmer acting as heat leak; power ¼ h.p. hermetically sealed unit, consuming 360 watts; dimensions, 24 in. by 24 in. by 64 in. high; weight 427 lb. For further details application should be made to the D. J. Mackridge Advertising Service, 11 Aldwych, London, W.C.2.

British Standards Recently Published.

B.S. 1182: 1955 **Cast brass thimbles (spigot and socket) and tailpieces.** This Standard specifies a comprehensive range of soil or waste pipe tailpieces and thimbles in straight and bent designs together with thimbles with vent arms; all being designed for use with standard sanitary fittings. There are annotated line diagrams. Price 3*s*.

B.S. 2592: 1955. **Thermoplastic flooring tiles.** This Standard specifies the requirements for materials, dimensions, colour, quality and mechanical tests of such tiles, sometimes called asphalt tiles. The Standard does not cover flexible or semi-flexible tiles made from vinyl chloride polymer and co-polymers or other polymeric compositions. Price 2s. 6d.

Practice Notes

Edited by Charles Woodward [*A*]

MINISTRY OF HOUSING AND LOCAL GOVERNMENT. Building Industry. Restrictive practices. Circular 32/55 dated 12 May addressed to housing authorities in England refers to the Report of the Monopolies Commission on the supply of buildings in the Greater London area, as announced in the House of Commons on 21 December 1954. The Minister of Works then said that in future firms would not be included in any list of approved Government contracts for new buildings if, in tendering for such work, they followed practices criticised by the Commission.

In a discussion between appropriate Government Departments and the representative bodies of local authorities as to how the arrangements criticised in the Report should be brought to an end, it was the view of the local authorities' representatives that local authorities generally should be informed of the action being taken by Government Departments in this matter.

Copies of the letter sent to all contractors on the Government lists and of the reply to be made by contractors are given in the Appendix to the Circular, and the local authorities will doubtless wish to consider what action they can usefully take, in the same spirit as that taken by Government Departments, to implement the recommendations of the Monopolies Commission.

The Circular and Appendix is obtainable at H.M. Stationery Office, price 2d.

GYPSUM PLASTERS. Increase of price. The British Plaster Board (Manufacturing) Limited have issued a notice that all grades of Plaster marketed under the brand names of 'Thistle' and 'Pharaoh' are subject to an increase in price of 5s. per ton as from 2 May.

SCOTTISH LOCAL AUTHORITIES. Building Bye-laws. More than two-thirds of Scottish local authorities (155 authorities out of 231) have now decided to adopt the new model building bye-laws which were issued by the Department of Health last year.

In several parts of Scotland coverage is almost complete. In Ayr County, for example, the county itself and each of the 17 small burghs have decided to adopt the bye-laws. Other counties almost completely covered are Aberdeenshire, Angus, Berwick, Dumfriesshire, Kincardine, Midlothian, Perthshire and Roxburgh. The builders who operate in these areas will no longer have to struggle with a variety of differing local specifications and requirements but will have a uniform standard to work to wherever they go in the area. This is an important advance which will help builders to reduce costs and speed up building time. No previous set of model bye-laws has achieved anything like the general acceptance gained by the present one. The last model bye-laws issued in 1937 were eventually adopted by only 69 authorities.

The new bye-laws offer other advantages besides the prospect of saving building time and building costs. From the point of view of fire dangers, for example, the report of Her Majesty's Inspector of Fire Services for Scotland, just published, says 'adoption of these model bye-laws is an important step forward in Scotland in the recognition of standard fire prevention measures which will materially assist brigades in their work of preventing fires'.

LAW CASES. Huyton-with-Roby U.D.C. v. Hunter. Court of Appeal. Private Street Works Act 1892. This appeal raised the question on whom does the burden lie of proving that a road is repairable by the inhabitants at large.

In this case magistrates had decided on the evidence that the road in question was a public road, and accordingly frontagers could not be charged by the U.D.C. for the cost of making up the road. A Divisional Court had reversed this finding, and Mr. Hunter appealed. In allowing the appeal the Court said that the magistrates having arrived at a finding of fact, it could not be reversed by the Divisional Court unless the magistrates had no evidence to support their finding, and that on the true interpretation of the Private Street Works Act 1892, if a local authority desired to charge a frontager with the cost of making up a street, the burden of proof was on them to prove that the street was not repairable by the inhabitants at large.

Mr. Hunter's appeal was allowed with costs and the U.D.C. was refused leave to appeal to the House of Lords. (THE ESTATES GAZETTE, 7 May 1955.)

McCombe v. Read. Damage to adjoining property by poplar tree roots. This was a claim by the plaintiff that the roots of poplar trees on defendant's land had caused damage to his house and he claimed damages for trespass, nuisance and negligence. He also asked for an injunction to restrain the defendant from continuing the trespass and nuisance.

The defence was a denial that the trees had caused damage and that the damage to the foundations of the house and drains was caused by the waterlogged site of the house.

The defendant's house was built in 1904 and the plaintiff's in 1912. The defendant planted the poplar trees soon after the plaintiff's house was built. The houses are built on a clay soil. Cracks appeared in the plaintiff's house in 1949 and one wall of the house was underpinned and the house repaired at a cost of £678. In 1952 and 1953 further settlements appeared in the plaintiff's house, the estimated cost of remedial measures being £1,032.

The Judge found in favour of the plaintiff. His Lordship said that it was old law that if a neighbour's trees encroached on one's ground by overhanging boughs or undermining roots, one might cut the boughs or the roots so far as they were on one's own side of the fence, but it could not be right to put upon the plaintiff the burden of watching for further subterranean encroachments. The plaintiff was not entitled to an unqualified injunction, for he had no remedy unless a nuisance was caused. The injunction would therefore be granted to restrain the defendant from allowing the roots of any tree on his property so to encroach on the plaintiff's property as to cause a nuisance.

The question of damages was referred to an Official Referee and judgment was given for the plaintiff with costs. (THE ESTATES GAZETTE, 14 May 1955.)

Jennings v. Tavener. Subsidence, shallow foundations, roots of trees. Damage to bungalow. In this case the plaintiff entered into a contract to purchase a bungalow which the defendant was erecting on an estate at Chingford. The purchase price was £1,566, and the bungalow was completed in May 1950, when the plaintiff took possession. Cracks appeared in the bungalow which it was alleged were due to shallow foundations in a clay soil and that the defendant had not cut away the roots of poplar trees, the trees being 30 to 35 ft. away and on land which did not belong to the defendant.

It was submitted on behalf of the plaintiff that when a house in course of erection is bought there are implied warranties that the house shall be built with reasonable skill and care, with good and proper materials, in an efficient and workmanlike manner, and be fit for human habitation. The defendant submitted that there were no such warranties.

The poplar trees had been removed, since when there had been no further trouble with the bungalow.

In giving judgment his Lordship said that the defendant should have known that poplar trees were likely to cause damage to property because literature had been published to warn builders of the dangers. It was certain that if he had employed an architect to supervise the work and inspect the site he would have known of the dangers caused by the presence of the trees. His Lordship found that the bungalow was not in a fit state for human habitation and had not been built in a workmanlike manner when handed over to the plaintiff. The defendant had failed to take the necessary steps to prevent settlement of the walls which resulted inevitably in cracks.

There had been a breach of the warranty implied in the case of the sale of a house in the course of construction. The obligation on the defendant was not confined to building the parts of the house above the ground but extended to the provision of proper foundations in places where they would not collapse. The defendant had assumed the responsibility of the site and building without an architect and failed to provide the plaintiff with a bungalow fit for human habitation, as he omitted to have regard to the well-known danger that the site of a house might be made unfit because the moisture might be extracted from the sub-soil by the roots of poplar

trees. He had not prevented the re-occurrence of the cracks by cutting the roots at a distance from the house or by asking the owner of the trees to do so.

Judgment was given for the plaintiff with costs, the damages having been agreed at £275. (THE ESTATES GAZETTE, 21 May 1955.)

Arbitration. Stating a case. In a recent case a County Court Judge refused to direct an arbitrator to state a special case giving reasons why he disallowed a compensation claim. The arbitrator had made his award and the Judge took the view that the arbitration was finished and that the Court had no power to deal with the application. Whether it was a good or bad award was no business of the Court; but there was no appeal which was one of the beauties of arbitration which people did not seem to realise. (*Note*. It would appear that during the hearing the arbitrator could have been asked to state a special case, and if he refused either party could have asked for an adjournment of the hearing so that an application could be made to the Court to direct the arbitrator to state a special case on any question of law arising in the course of the reference or to make his award in the form of a special case for the decision of the High Court. The parties in this case do not appear to have appreciated the provisions of the Arbitration Act 1950.)

Book Reviews

City Planning in Soviet Russia, *&c.*, by *Maurice Frank Parkins.* 9½ in. xiv + 257 pp. incl. pls. (plans). + endpaper maps, text illus. Chicago: University Press; Cambridge: U.P. 1953. £2 5*s.*

As the author has consulted all the Russian publications on planning that he was able to find, this book is a useful source of information. The excellent bibliography, which takes up about half the book, is of course not restricted to works in Russian and should be very useful to others wishing to study this or allied subjects. Conjecture and 'interpretation' have on the whole been avoided and the reader can readily draw his own conclusions.

The historical survey of Soviet town planning until the war is well done and the importance of the Moscow plan which appeared in 1935 is rightly appraised. Mr. Parkins is much less well informed about post-war work and is quite misinformed about the trend towards higher buildings. 'In Moscow', he says, 'except for greater emphasis on two-storey house construction, the 1935 plan has been used without noticeable modifications.' In fact no two-storey houses whatever are envisaged, apart from a group of about a dozen villas near the University, and, perhaps with insignificant exceptions, all new housing has been in blocks of from 8 to 16 storeys. In Leningrad, Stalingrad and Kiev the trend is the same, though the buildings are not so high.

At the end of 1953 the generally accepted view in Russia was that two-storey dwellings were quite out of place in cities. It now seems, from recent discussions among Soviet architects, that this may be somewhat modified in future.

If one is restricted, as Mr. Parkins has evidently been, to reading Russian publications and reports based on them, it is possible to get the impression that architects there are restricted by rigid 'directives' on design. On visiting them one finds that they have what is in many ways an enviable freedom to design as they like. Mr. Parkins quotes examples, which he seems to find puzzling, to show that in spite of what he calls 'the profession's complete subordination to the prevailing Party line' some of the most respected architects have continued to oppose it, to teach other principles and to produce admired buildings.

The book has a number of small plans, but the few detail sketches are not very useful. There are some interesting statistics, perhaps the most striking being those on housing, which indicate that from 1940 to 1949 floor space equivalent to about 2,000,000 dwelling units was provided in cities and towns, plus 2,700,000 units constructed or restored in rural areas; in 1951 nearly a million units were provided. This gives point to the author's remark: 'Though some Soviet principles strikingly resemble ours . . . in the Soviet Union the nature and wide range of governmental powers permit their implementation in most cases'. COLIN PENN [*A*]

St. Stephen's Chapel [Westminster] and its place in the development of Perpendicular style in England, by [*J.*] *Maurice Hastings.* 8¼ in. xiii + 257 pp. incl. front. and 56 pls., 1 folding. text illus. Cambridge: U.P. 1955. £2 2*s.*

This work grew out of, though far beyond, an interesting historical controversy. In 1944 Mr. John Harvey claimed, in *Henry Yevele*, that the chapel was one of the first buildings in which 'Perpendicular' features were introduced, and claimed that William de Ramseye and William Hurley virtually invented the style; he elaborated this theme in *Gothic England* (1947), qualified the statement, and described the new phase as a 'national style'. In 1949 January and December the present author developed the theme from a different standpoint in the ARCHITECTURAL REVIEW, calling the phase the 'court style'.

This book amplifies the whole subject, referring, in a footnote, to Harvey's 'independent conclusion' and querying the original 'invention' claim. It is, however, a comprehensive work on the whole subject of the building, its details and contents; it is minutely documented and well illustrated by early drawings and by photographs, and throughout aptly compares other contemporary buildings. An interesting pictorial restoration of the interior is given. There is a short bibliography (oddly, not citing Harvey's works) and a good index.

There will always be a fascination in the attempted reconstruction of a long-disappeared building—*vide* Mr. John Summerson's recent broadcast on the Tudor Theobalds Park, Herts—and this chapel, with its central historical associations and miracles of craftsmanship, is by no means an exception to the rule. H. V. M. R.

Cambridgeshire, by *Nikolaus Pevsner.* (The Buildings of England *series*, BE 10.) 7¼ in. 454 pp. + 72 pls. text plans. Harmondsworth: Penguin Bks. 1954. 5*s.*

The latest volume of *The Buildings of England* differs from its predecessors in that half of it deals with one town; it differs from other books about Cambridge buildings in several significant ways. It pays particular attention to interesting buildings of the last 50 years; the houses of Baillie Scott for instance are sympathetically mentioned. It is full of concise and telling criticism. It laments the notorious timidity of Cambridge in architectural matters and makes an eloquent plea for buildings 'in the style of our century'. Its somewhat didactic judgements—Impington Village College 'is one of the best buildings of its date in England, if not the best'—will be acceptable to most readers.

All this makes it an absorbing and highly readable book. But it would not be honest to commend it without mentioning the large number of mistakes which reduce its value as a guide or as a book of reference. One would expect, for example, an authoritative note on the authorship of Horseheath Hall. But in one place it is attributed to Pratt and in another to Webb.

The photographs are excellent—well chosen and remarkably well reproduced for so cheap a book.

PETER BICKNELL [*F*]

Architecturally Speaking, by *Eugene Raskin.* Illus. by Robert Osborn. 8½ in. xix pp. + 129 pp. incl. pls. text illus. [New York]: Reinhold pub. Corpn.; Lond.: Chapman & Hall. 1954. £1 8*s.*

Every discussion on architecture is bedevilled with abstract nouns which it is apparent to unprejudiced observers (such as editors), convey different meanings to different persons. Such words as 'style', 'proportion', 'unity', 'scale', 'harmony', 'composition', 'functionalism', and, above all, 'beauty' are bandied about or used as verbal weapons in assailing those works of architecture one does not like. The resultant 'disagreements are seldom resolved but continue to grow in both magnitude and intensity until they finally achieve the respectable status of Schools of Thought'—to quote the book under review.

The author of it is Associate Professor of Architecture at Columbia University, but that post represents but one of several of his activities; another is concern with the science of semantics—i.e. the meanings of words or, more precisely, what various words signify to different persons. Professor Raskin has combined these two activities in an endeavour to find some solid

ground in the semantic morass in which discussions on architecture commonly flounder.

A book on this subject could easily have been pedantically stuffy. Professor Raskin's is the very reverse. It is clear and concise; one can read it without excessive mental stress in an hour or two. It is liberally salted with wit of the debunking kind; as early as page 6 Professor Raskin, discussing the definition of the word 'architecture', remarks that Sir Henry Wotton's famous phrase 'firmness, commodity and delight' could be used to describe Miss Marilyn Monroe just as aptly as the Parthenon. Elsewhere, referring to 'the merciless criticism to which the architect subjects his inspirations', he says in parenthesis 'I seem to be speaking of the ideal architect'.

The wit adds point to statements which one feels are penetratingly true. Never before has there been more talk about the art of architecture than today, and much of that talk is ill-founded on woolly thinking, sentimentality and self-esteem. Professor Raskin blows a welcome blast of fresh air through the fog of talk. The chapter on 'originality' is humbling; that on 'scale' and the means of achieving it is a positive contribution to a neglected study. The chapter on 'sequences' deals with an even more neglected study, namely the effect of a building on the beholder as he approaches, enters and walks through it—the process, in fact, by which architecture is appreciated. On 'proportion', the Professor will have no truck with rules—'golden rectangles and all such mystical nonsense'; but here one feels he is on rather more debatable ground than elsewhere in his book.

The somewhat acid line drawings by Robert Osborn are entirely appropriate. For example, Osborn's marginal comment on a discussion of the traditional-versus-modern argument depicts a skinny individual dressed as a Roman soldier, but wearing pince-nez, assailing with a sword a hideous dwarf in skin-tight black, wearing a gas mask and clutching a space gun and hand-grenade. Clearly, both Professor Raskin and his illustrator regard such arguments as futile and a fit subject for satire.

This book could be read profitably by all those who write about the theory of architecture, especially architectural critics. At least it would make them ponder the implications of the words they use. The average working architect, also, would find its clear thinking on fundamentals a useful guide in design. ERIC L. BIRD

Proceedings at a Symposium on Aluminium in Building, London, 1953. *Aluminium Development Association.* 8½ in. 130 pp. incl. pp. of illus. text illus. Lond. 1954. 4*s.*

This is a record of three papers presented at the Symposium, the preliminary remarks by the President of the A.D.A., the discussions and the authors' replies. The first two papers survey the problem from the varied points of view of the architect and the designer and craftsman; the third is concerned with the specific applications of aluminium on roofing and cladding.

Early Venetian Painters 1415–1495, by *F. M. Godfrey.* (Chapters in art *series.*) 7¼ in. vi + 42 pp. and pls. and pp. of illus. Tiranti. 1954. 8*s.* 6*d.*

A new monograph in Tiranti's useful and inexpensive series, comprising short appreciations of the leading painters of this transition period, biographical notes on each and 76 annotated plates. There is a short bibliography.

Das Maurerbuch. Ein Fachbuch, *&c.*, by *Anton Behringer* and *Franz Rek.* 6th ed. 11½ in. 388 pp. incl. pp. of illus. text illus. Ravensburg: Maier. [1953.] DM48.—.

Roughly (but not precisely) translatable as 'the masons' book', this volume deals painstakingly with every stage in the erection of a building. Each process is illustrated with characteristic German thoroughness. The authors deserve particular commendation for explaining new methods and materials as well as traditional systems. Although the first edition was published less than six years ago, more than 50,000 copies of the book have already been sold, a proof of its value in German-speaking countries.

Correspondence

The Editor, R.I.B.A. Journal.

SYMPOSIUM ON HIGH FLATS

SIR,—In his letter in your last issue Colonel Jensen says he 'included information relating to the costs of New Towns' in his paper 'to correct a number of erroneous statements which are gaining currency'.

Amongst erroneous statements which I hope will not gain currency are some for which Colonel Jensen is responsible. In his paper he stated that the recent New Towns Report '*shows*' the average cost of houses at Bracknell to be £4,700, and has since set out to prove it. In fact the Report shows nothing of the sort and Colonel Jensen's attempt to prove it is mathematically unsound for the reasons given in my previous letter, which the Colonel ignores.

Yours faithfully,

L. H. KEAY.

FORM AND REFORM IN ARCHITECTURE

SIR,—A review of my book *Form and Reform in Architecture* which was published in June last year has not appeared in THE JOURNAL until now. This is a somewhat long delay, nevertheless one which has had one happy result; namely that of enabling me to have the benefit of a large number of other opinions on my work before reading about the somewhat discouraging impression which I have evidently made on your reviewer. I may say that of the very large number of reviews I have had virtually all have been either sharply (sometimes even violently) for, or against, my thesis. I would like therefore now to ask these questions. Does this sharp cleavage in opinion amongst reviewers in fact not support my thesis, which was that two irreconcilable points of view can exist with regard to architectural design? and may not the faults which many reviewers have been so eager to attribute to me lie less in my effort to unite opposing schools of design than in the present condition of critical opinion?

Yours etc.,

BERTRAM HUME [*F*]

[*Editor's note:* A copy of Mr. Hume's letter was forwarded to Mr. Robert Townsend, the reviewer (see p. 306, May JOURNAL), who replies:

'I should like to apologise to the readers of my review of Mr. Bertram Hume's book for an error which crept in between the manuscript and the printed text. The third paragraph should read: "If the author is not comprehensive neither is his analysis of the ideas of the reformers he has selected adequate. There is not space in a review to discuss his views; it appears to me, however, that in his attempt to demonstrate that the selected protagonists have been dominated by concepts which are 'romantic' and therefore false instead of 'classic' (the true significance *of* '*classic*' is dealt with in later parts of the book and seems surprisingly like Sir Howard Robertson's *Principles of Architectural Composition* and would undoubtedly be accepted by many exponents of what Mr. Hume would condemn as picturesque design) *he has done less than justice to both their views and their achievements.*" The corrections are indicated by italics.']

MATERIALS AND TECHNIQUES

SIR,—I refer to Mr. Kent's [*Ret. L.*] remark '. . . if he is a modern operative, . . .? I am sorry for you, I can offer nothing but sympathy.'

On the contrary, I usually experience greater interest and co-operation from the young operative when new technical methods based upon B.R.S. explanations are asked for than from the older men, who tend to regard new techniques as youthful inexperience. But of course, one of the architect's most important jobs and skills, which is seldom mentioned and impossible to teach, is to know how to talk to the modern operative.

Architects should now have all the necessary technical knowledge, but what use is this if it cannot be put across to the man on the job at whose hands it can be thwarted?

Yours faithfully,

KENNETH G. MILLER [*A*]

Notes and Notices

NOTICES

Session 1954–55. Minutes VIII. At the Eighth General Meeting of the Session 1954–55 held on Tuesday 17 May 1955 at 6 p.m.

Mr. S. Rowland Pierce, Vice-President, in the Chair.

The meeting was attended by about 200 members and guests.

The Minutes of the One Hundred and Seventeenth Annual General Meeting held on Tuesday 3 May 1955 were taken as read, confirmed and signed as correct.

The following members attending for the first time since their election were formally admitted by the Chairman: *As Fellows:* G. C. Duke, R. R. Grant, J. C. Ratcliff. *As Associates:* F. G. Dixon, G. E. Grimsley, Bernard Needham, G. L. Worsley.

Professor Sir William Holford, M.A., M.T.P.I. [*F*], having read a Paper on 'Conditions of Building in City Centres' a discussion ensued and on the motion of Sir George Pepler, C.B., F.R.I.C.S., P.P.T.P.I. [*Hon. A*], seconded by Mr. Frederick Gibberd, C.B.E., M.T.P.I. [*F*], a vote of thanks was passed to Professor Sir William Holford by acclamation and was briefly responded to.

The proceedings closed at 7.50 p.m.

Members and Professional Affixes. The Council's attention has been called more than once to the practice among some members of adding a string of letters of doubtful value to the affix indicating membership of the Royal Institute on their letter paper.

This is a matter in which the Council obviously cannot dictate to members, and must trust to their good sense. It should be obvious, however, that the affix of a chartered body of high standing is weakened in effect by the addition to it of a string of other mysterious designations, some of which probably indicate no more than the payment of an annual subscription.

R.I.B.A. Award for Distinction in Town Planning. The R.I.B.A. Award for Distinction in Town Planning is the only award in town and country planning bestowed by the R.I.B.A. It is by conferment only and is limited to Fellows, Associates and Licentiates of the R.I.B.A. Outstanding work in the design and layout, not of individual buildings, but of groups of buildings will be recognised. The award will be made for actual planning work and while not primarily intended for housing layouts, such layouts of groups of buildings would not be excluded.

Recommendations are submitted to the Council by a Standing Committee set up for the purpose. Personal applications by candidates will not be entertained; the name of a candidate must be submitted by three or more sponsors, themselves members of the R.I.B.A., who will be required to submit details of the candidate's professional qualifications and experience and evidence of the candidate's actual planning work. Nominations may be made twice annually, on 1 March and 1 November, and must be addressed to the Secretary, R.I.B.A., 66 Portland Place, London, W.1.

Members upon whom the award has been conferred will be entitled to use the designation 'R.I.B.A. Award for Distinction in Town Planning' and it is advised that this should be used in full, or the initials 'Dist. T.P.' after the initials 'F.R.I.B.A.', 'A.R.I.B.A.', or 'L.R.I.B.A.', according to the class of membership to which they belong.

Correspondence with the Institute. In order to facilitate speedier attention to correspondence, and to relieve the staff of a great deal of research, it is particularly requested that members and Students will kindly state in all correspondence with the Institute the class of membership (F, A, L or Student) to which they belong.

Forms of Agreement for Use between a Building Owner and an Architect. Members are reminded that, on the recommendation of the Practice Committee, the Council have approved the publication of Forms of Agreement in the four following editions:

(i) *Form of Agreement for General Use between a Private Building Owner and an Architect or Firm of Architects;*

(ii) *Form of Agreement for General Use between a Building Owner (including a Statutory Authority) and a Firm of Architects;*

(iii) *Form of Agreement between a Local Authority and a Firm of Architects for Housing Work;*

(iv) *Form of Agreement between a Local Authority and a Firm of Architects for Multi-Storey Flats.*

In addition, on the recommendation of the Competitions Committee, the Council have approved a *Form of Agreement between the Promoters and a Firm of Architects appointed as the result of a Competition.*

The respective forms have been carefully designed to include all the essential points on which a clearly defined agreement between a building owner and an architect is needed, and to omit many irrelevant and repetitive clauses which, in the experience of the Institute, are so frequently inserted.

The five documents are now available in printed form, and may be obtained on application to the Secretary, R.I.B.A., 66 Portland Place, London, W.1 (price 6*d.* per copy, inclusive of purchase tax). Postage 3*d.*

BOARD OF ARCHITECTURAL EDUCATION

R.I.B.A. Maintenance Scholarships in Architecture. The R.I.B.A. offer for award in July 1955 the following maintenance scholarships in architecture, tenable from 1 October 1955:—

The Howe Green 4th and 5th year Maintenance Scholarship of £40 to enable students who have passed the Intermediate stage to complete an approved course at a school of architecture recognised for exemption from the R.I.B.A. Final Examination.

One R.I.B.A. Houston Maintenance Scholarship of a maximum value of £125 per annum. It is available for any stage of training at a recognised school of architecture and is awarded in the first instance for one year. It is renewable from year to year. (The Houston Maintenance Scholarships are for the purpose of providing educational and maintenance allowances for the sons of architects and artists, who may be, or at the time of their death were, in impecunious circumstances, whether such architects or artists be alive or dead.)

The Hartley Hogarth Maintenance Scholarship to provide grants towards the fees for architectural study at a recognised school of architecture is available to any student or students who produce satisfactory evidence of having been resident in the Borough of Keighley for a period of 10 years prior to 1 October of the year in which the application is made. Its value will be that of the fees of the school of architecture selected.

An R.I.B.A. 4th and 5th year Maintenance Scholarship of £60 to enable a student who has passed the Intermediate stage to complete an approved course at a school of architecture recognised for exemption from the R.I.B.A. Final Examination.

The Ralph Knott Memorial Maintenance Scholarship of a maximum value of £45 per annum (tenable only at the School of Architecture, The Architectural Association, London).

The scholarships are intended to enable promising students, whose parents or guardians have not the necessary means, to attend approved courses at the schools of architecture recognised for exemption from the R.I.B.A. examinations. Students already taking such a course are also eligible to apply for a scholarship. The scholarships are available only for students who are British subjects by birth or naturalisation.

The value of the scholarship, up to the limits stated, will depend on the financial circumstances of the parents or guardians of the candidate. The parents or guardians will be required to furnish particulars on the proper form of their financial position.

Applications for the scholarships (in accordance with the regulations for applications) must be made to the Secretary to the Board of Architectural Education. The closing date for the receipt of applications, duly completed, is 29 *June* 1955. The awards will be announced towards the end of July 1955.

COMPETITIONS

Stand at the Building Exhibition, Olympia, 1955. Ascot Gas Water Heaters Ltd. invite architects and students of architecture who have reached the R.I.B.A. Intermediate stage or its equivalent to submit designs in competition for a stand to be erected at the Building Exhibition, Olympia, 1955.

Assessors: Mr. C. S. Mardall [*F*], Mr. F. R. Yerbury, O.B.E. [Hon. A.].

Premiums: 200 gns., 100 gns., 50 gns.

Last day for submitting designs: 8 July 1955.

Conditions may be obtained on application to Ascot Gas Water Heaters Ltd., 255 North Circular Road, N.W.10.

ALLIED SOCIETIES

Changes of Officers and Addresses

Berks, Bucks and Oxon Architectural Association. President, E. Steward Smith [*F*]. Hon. Secretary, A. J. Miller [*A*]. (Both from 1 July).

Bristol and Somerset Society of Architects. President, T. W. Snailum [*F*]. (From 1 July.)

Essex, Cambridge and Hertfordshire Society of Architects. President, C. I. Hobbis [*A*]. *Chelmsford and District Chapter:* Chairman, M. McP. Crammond [*A*]. *Hertfordshire Chapter:* Hon. Secretary, W. W. Turney [*L*]. *West Essex Chapter:* Chairman, R. C. Harrison [*A*].

Gloucestershire Architectural Association. President, R. F. Fairhurst [*A*]. (From 1 July.)

Leicestershire and Rutland Society of Architects. The Hon. Secretary, A. Drew-Edwards [*A*] has changed his address to 34 Princess Road, Leicester.

Northamptonshire, Bedfordshire and Huntingdonshire Association of Architects. President, F. C. Levitt [*L*]. *Northamptonshire Branch:* Chairman, Captain J. F. Goff [*A*]. (Both from 1 July.)

Nottingham, Derby and Lincoln Society of Architects. President, W. Caparne Baldry [*L*]. Hon. Secretary, J. Gordon Woollatt, D.F.C., M.A. [*A*]. *North Lincolnshire Branch:* Chairman, G. H. Turner [*L*]. Hon. Secretary, J. Main, 103 Lady Frances Crescent, Cleethorpes. (All from 1 July.)

Preston, Blackburn and District Society of Architects. President, C. E. Pearson [*F*].

South Eastern Society of Architects. Kingston-on-Thames District Chapter. Chairman, H. W. Ashbey [*L*]. *Tunbridge Wells District Chapter:* Chairman, R. A. Cooksey [*F*]. (Both from 1 July.)

South Wales Institute of Architects. Central (Cardiff) Branch. Chairman, Trevor Hill [*A*]. (From 1 July.)

Royal Incorporation of Architects in Scotland. President, William McCrea [*F*].

Architectural Institute of British Columbia. President, J. Lovatt Davies, 923 Denman Street, Vancouver 5, B.C.

Manitoba Association of Architects. President, Cecil N. Blankstein, 222 Osborne Street, Winnipeg, Man.

Saskatchewan Association of Architects. President, Frank J. Martin, 110 Metropolitan Building, Saskatoon, Sask.

Natal Provincial Institute of Architects. President, J. C. Simpson [*A*].

Wilts and Dorset Society of Architects. Annual Dinner. The annual dinner of the Wilts and Dorset Society of Architects was held at the Grand Hotel, Swanage, on 22 April. Mr. W. N. Oliver [*L*], President, was in the Chair and with Mrs. Oliver, Mr. C. H. Aslin, C.B.E., President R.I.B.A. and Mrs. Aslin, received members and guests. Among the guests were Brigadier A. C. Sykes, C.B.E., Chairman of the Wiltshire Branch of the Council for the Preservation of Rural England; Mrs. Shore, J.P., Chairman of the Swanage Urban District Council; Colonel A. D. Pass, Chairman of the Dorset County Council; Mr. L. Abbott, County Planning Officer of Dorset; Mr. D. N. Willoughby, President of the Hants, Dorset, South Wilts and Channel Islands Branch of the Royal Institution of Chartered Surveyors; Mr. P. S. Falconer [*F*], President of the Gloucestershire Architectural Association; Mr. J. Nelson Meredith [*F*], President of the Bristol and Somerset Society of Architects; and Mr. J. Brandt [*F*], President of the Hants and Isle of Wight Architectural Association.

Brigadier Sykes proposed the toast of the R.I.B.A. and its President and spoke of Mr. Aslin's immense contribution to the work of school building. Mr. Aslin replied. Mr. J. Nelson Meredith proposed the toast of the Wilts and Dorset Society. He congratulated the society on the work it had achieved in Wiltshire with the advisory panel of architects and hoped that in the very near future a similar panel would operate in Dorset. Mr. Oliver, replying, spoke of the necessity for the education of the public in architecture and referred to the work of the R.I.B.A. in this sphere. Mr. O. S. Brakspear [*A*], Vice-President of the Wilts and Dorset Society of Architects, proposed the toast of Swanage, and Mrs. Shore, replying, said how proud Swanage was of its new award-winning housing estate. Mr. Douglas Webster [*A*] proposed the toast of the guests, and Mr. Brandt replied.

GENERAL NOTES

The Trinidad and Tobago Society of Architects. The Trinidad and Tobago Society of Architects recently held a most successful and attractively staged exhibition portraying members' work since 1945. Well over 1,000 people from all parts of the island visited the show, which was the first ever held in the Caribbean, and was opened by His Excellency the Acting Governor, Mr. Maurice Dorman, C.B.E.

Throughout the week members of the Society were in attendance to 'talk shop', and there were some lively discussions on the buildings illustrated and on architectural topics generally, whilst the exhibition was supported with a talk on Radio Trinidad by the Chairman of the Society, A. J. Prior [*F*], the Secretary, Ronald Firth [*A*], J. Newel Lewis [*A*], and Anthony Lewis [*F*], the two latter being the designers of the display. Peter Bynoe [*A*] gave a talk on 'Theory of Modern Architecture' to an audience of about 70 people.

Courses in Concrete Practice. The course in concrete practice established by the City and Guilds of London Institute in 1954 has now been extended into a second year for the benefit of those students who wish to gain a more advanced knowledge of the subject. There will be one 2-hour evening lecture per week for a period of 24 weeks. An examination, consisting of a written paper and an oral test, will be held in May 1956 and certificates (Grade II) will be awarded to successful candidates. Full particulars can be obtained from the City and Guilds of London Institute, Department of Technology, Gresham College, Basinghall Street, London, E.C.2, price 6d.

Obituaries

Sidney Kyffin Greenslade, formerly a Fellow of the Institute, died on 28 February, aged 88. Mr. Greenslade was Pugin Student 1891, Grissell Medallist 1897 and Godwin Bursar 1900. He was a friend and contemporary of Professor Lethaby.

Mr. Greenslade's best known works are the Welsh National Library and Eton College war memorial. In addition to architecture he was greatly interested in arts and crafts and was a great collector of old glass and china and also of the work of the artists of his day. A part of his collection of the pottery of the Martin brothers was at one time on view at the Victoria and Albert Museum. He was a member of the Art Workers' Guild.

Mr. Greenslade was a member of Council 1906–1909 and 1910–1914 and served as an assistant of the Board of Examiners (Architecture) 1901–1910. He also served on the Art Standing Committee, the Records Committee, the Competitions Committee and the Royal Gold Medal Committee.

Dr. Thomas Jones, C. H., writes as follows: 'Sydney Kyffin Greenslade was the son of John George Greenslade, Chief Clerk of the Probate Court at Exeter, and his wife Elizabeth Ann (née Beck). He was born in 1866 and died on 28 February 1955. He was articled to Exeter architects (Ashworth and Jerman) before going to London, where he won a Godwin Bursary and other prizes and medals. Around 1900 he went to the United States to study libraries. Among his professional friends thereafter were Caroe, Lethaby and Philip Webb, Dunbar Smith and Cecil Brewer, Stanley Hall and Vincent Harris. He was associated in the designing of various churches and libraries, including the City Library and St. David's Church, Exeter, the library of Eton College, and (his chief work) the National Library of Wales on a superb site at Aberystwyth. A limited competition was held in 1909. The Assessor was Reginald Blomfield and he recommended Greenslade's design as 'the finest and most scientifically planned of any submitted in this competition'. In May 1909 Greenslade was appointed architect to the Library.

'Greenslade was a "character" whose great gifts were apt to come to grief because of his inability to put up with contractors and the routine business of his profession. At first, owing to World War I, only a portion of the Library was completed but in 1927 when further advance was possible Greenslade's ill health delayed the work and it was agreed that the building should be completed by Messrs. Adams, Holden and Pearson, who were suggested by Greenslade.

'Greenslade's fine taste and judgment found relief in the untrammelled role of collector of glass, pottery, etchings and fine books. He specialised in the salt glaze stoneware fired by the Martin brothers in a kiln at Southall and some readers will recall his brilliant talk at the Art Workers' Guild with Wallace, one of the diminutive brothers, present. For some years he bought objects for the Fitzwilliam at Cambridge and for the Art Museum at the University College at Aberystwyth. To young architects he was always helpful and in congenial company a sparkling talker. To go through an art exhibition with him was an exhilarating experience. He was never married but he was the friend of every child he met.'

Frank George Richardson [*Retd. A*] died on 1 September 1954 in Melbourne, Australia, at the age of 83.

Mr. Richardson was born in Victoria, Australia, articled in 1891 to a Melbourne architect and then came to England, working for a time in London. In 1907 he returned to Melbourne and took up private practice there. He built a number of cinemas in Melbourne in the early days of moving pictures, many of which are still in use, and also designed a number of flats when this type of dwelling was comparatively rare there.

Cecil H. Fox [*L*] died on 15 March, aged 50.

Mr. Fox studied at the Brixton School of Building and was articled to Mr. A. E. Batzer [*A*], with whom he afterwards remained as assistant. During the war Mr. Fox served as a major in the Royal Engineers and was responsible for the construction of a number of airfields and airstrips in the Far East. He returned to Mr. Batzer and, when the practice was sold, joined Messrs. Jas. M. Monro & Son [*A*] of Watford, Herts, and London, as senior assistant in their London office.

Mr. Edward Attree [*Retd. L*] died at his home at Penarth, Glamorgan, on 17 February after a short illness.

Mr. Attree served his articles with the late Mr. Arthur Pannett, of Haywards Heath, Sussex, and began his career with the East Sussex County Council. Following his retirement in 1945 after 40 years' service with the Glamorgan County Council he worked at the

Technical Centre of the War Damage Commission, Cardiff, as an Assessor. Later he spent two years on the architectural staff of Messrs. Wm. Hancock and Company Ltd., Cardiff.

During the 1914–18 war he served with the Artists' Rifles and acted as a bombing instructor.

He was a past master of the Bute Lodge, Cardiff, and held Provincial rank. He was also interested in many other masonic organisations.

Mr. Attree bequeathed his body to medical research.

Members' Column

This column is reserved for notices of changes of address, partnership and partnerships vacant or wanted, practices for sale or wanted, office accommodation, and personal notices other than of posts wanted as salaried assistants for which the Institute's Employment Register is maintained.

APPOINTMENTS

Major K. Martin Baxter, T.D., A.M.T.P.I. [*A*], has been appointed to the newly created post of Borough Architect, Bolton, as from 2 August next. From that date his address for all purposes will be Town Hall, Bolton (Bolton 4200).

Mr. Hugh C. Duncan [*A*] has been appointed Company Architect to Rodwell Properties Ltd., 9 Hertford Street, Park Lane, London, W.1 (GRO. 5712) where he will be pleased to receive trade catalogues, etc.

Mr. W. G. Gregory [*A*] has resigned his appointment as Deputy Chief Architect, Mauritius, and has taken up the post of Senior Lecturer in the School of Architecture at the University of Hong Kong.

Mr. Roger K. H. Johnson [*A*] has joined the staff of the University of Cape Town School of Architecture, where he will be pleased to receive trade catalogues, etc. His address is School of Architecture, University of Cape Town, Rondebosch, Cape Town, South Africa.

Mr. Arthur Ling, M.T.P.I. [*A*], has now taken up his appointment as City Architect and Planning Officer with the Coventry Corporation at the following address: Bull Yard, Off Warwick Row, Coventry (Coventry 64064).

PRACTICES AND PARTNERSHIPS

Messrs. Abbey and Hanson [*L/A*] of 11 Cloth Hall Street, Huddersfield, have appointed **Mr. Eric H. Knight** [*A*] in charge of their office at No. 11 Wyle Cop, Shrewsbury (Shrewsbury 4722). Trade literature and samples will be welcomed.

Messrs. J. S. Gibson and Gordon [*F*] have taken into partnership **Mr. Adrian A. Montagu** [*F*]. They will practise under the name of Messrs. J. S. Gibson, Gordon and Montagu at their present address, 2 Devonshire Terrace, Marylebone Road, London, W.1.

Messrs. Samuel Jackson and Son (Mr. J. H. Brunton [*L*] and Mr. Stanley Bradley [*A*]) Ocean Chambers, Piccadilly, Bradford, have taken into partnership **Mr. Arthur Gemmell,** A.R.I.C.S. [*A*], and have opened an office at 3 Manor Square, Otley, Yorks (Otley 2856), where they will be pleased to receive trade catalogues, etc.

The firm of **Sergei Kadleigh, William Whitfield and Patrick Horsbrugh** [*AAA*] has amalgamated with the firm of **Raglan Squire and Partners** [*F*]. In future both firms will carry on business under the name of Raglan Squire and Partners at 3 Hobart Place, London, S.W.1.

Messrs. Laurence Gotch and Partners [*F/LL*] have taken into partnership **Mr. J. P. R. Black,** A.M.T.P.I. [*A*], and the title of the firm will be changed to **Gotch and Partners,** at 8 City Road, London, E.C.1, and 26 Regency Square, Brighton, Sussex.

Messrs. Morter and Dobie [*FF*] announce that an agreement has been made with Messrs. W. P. Horsburgh and Son [*F*] to co-operate with them in the carrying on of their practice as from 1 July 1955. The combined practices will be conducted under the name of **Morter and Dobie, incorporating William P. Horsburgh and Son,** at 2 Exchange Street East, Liverpool 2.

Mr. N. M. Phillips [*A*] has begun private practice at 43 Oxford Street, Workington.

Mr. Alan S. Raimes [*A*] has begun practice at Terminus Chambers, 6 Holborn Viaduct, London, E.C.1 (CITy 4201).

Mr. D. Watkin Rees, F.R.I.C.S. [*L*], of National Provincial Bank Chambers, Ammanford, South Wales, has taken into partnership **Mr. J. Dudley Walters** [*A*] and the firm will continue to practise as **D. Watkin Rees and Walters** from that address.

Messrs. Llewellyn Smith and Waters (Mr. A. B. Waters, M.B.E., G.M. [*F*], and Mr. A. Llewellyn Smith, M.B.E. [*F*]), of 103 Old Brompton Road, London, S.W.7, announce that they have taken into partnership Mr. B. G. Fender, A.R.I.C.S. [*A*], Mr. R. S. Laskey [*A*] and Mr. F. H. Lloyd [*A*], who have been on their staff for a number of years. The style of the firm will remain the same.

Mr. J. Tomlinson [*A*] and Mr. W. H. McAlister [*A*] have dissolved their former partnership, and Mr. Tomlinson is carrying on practice on his own account at 4 Waring Street, Belfast (Belfast 30449). He will be pleased to receive trade catalogues, etc.

CHANGES OF ADDRESS

Mr. D. S. Best [*A*] has changed his address to 13 Shderoth Hahayil, Yad Eliyahu, Tel Aviv, Israel.

Mr. A. R. Bramley [*A*] has changed his address to 36 Vibart Road, Yardley, Birmingham 26, following his recent promotion to District Surveyor to the Ministry of Works, Birmingham.

Mr. Robert C. Carvell [*L*] has removed his office to 20 Marshall Place, Perth (Perth 650), and will be pleased to receive trade catalogues, etc., at this address.

Mr. D. St. C. Cheyne [*A*] has changed his address to 2 The Park, Upper Dunmurry Lane, Dunmurry, Co. Antrim, N. Ireland.

Messrs. Covell and Matthews, A.M.T.P.I. [*F/A*], have moved to 34 Sackville Street, Piccadilly, W.1 (REGent 2291–3).

Mr. A. Douglas [*A*] has changed his address to P.O. Box 1530, Lusaka, Northern Rhodesia.

Messrs. Dowton and Hurst (Mr. R. J. Hurst [*F*] and Mr. D. S. Pearce [*A*]) have moved to 10 Portman Street, Portman Square, London, W.1 (LEGation 1822–4).

Mr. Francis S. Fraser [*A*] has changed his address to Government of Gold Coast P.W.D., P.O. Box 136 (Architects), Accra, Gold Coast, West Africa.

Mr. R. A. Green [*A*] has moved to 7 St. Petersburgh Mews, Bayswater, London, W.2.

Mr. M. Rhys Griffiths [*A*] is now at Architectural Branch, P.W.D., P.O. Box 136, Accra, Gold Coast, West Africa.

Messrs. Hiscock and Duncan Scott [*FF*] have removed their offices to 32 London Road, Guildford, Surrey (Guildford 67684–5). The practice will continue under the style of **R. Duncan Scott and Partners.**

Mr. Alexander Garland Kirkwood [*A*] has changed his address to: c/o Mr. Louis Fabbro, 251 Lorne Street South, Sudbury, Ontario, Canada.

Mr. A. Wilson Kneale [*L*] has ceased private practice at Bramhall, Cheshire, and his address is now Llys Menai, Menai Avenue, Bangor, N. Wales.

Mr. H. J. Lane-Davies [*A*] has changed his home address to 27 Bolton Gardens, London, S.W.5.

Mr. J. Hewitt Mitchell [*A*] has changed his address to 137 Streatham High Road, London, S.W.16.

Messrs. Mussen, Mackay and Potter [*F*], architects and civil engineers, of 383 Latrobe Street, Melbourne, have opened an office at Industry House, Barton, Canberra, A.C.T. **Mr. E. J. Scollay** [*A*] will be in charge of the Canberra office and Mr. Theo Bischoff will remain in charge of the office at the Medical School site, Australian National University, Canberra, A.C.T. Both offices will be pleased to receive trade catalogues, etc.

Mr. James B. Thomson [*A*] has taken up residence in Australia, where his address is 61 Malcolm Street, Perth, Western Australia.

Messrs. Watkins, Coombes and Partners [*F/AA*], Lincoln, are opening a branch office in Belgrave Square, Scunthorpe, and will be pleased to receive trade catalogues, etc.

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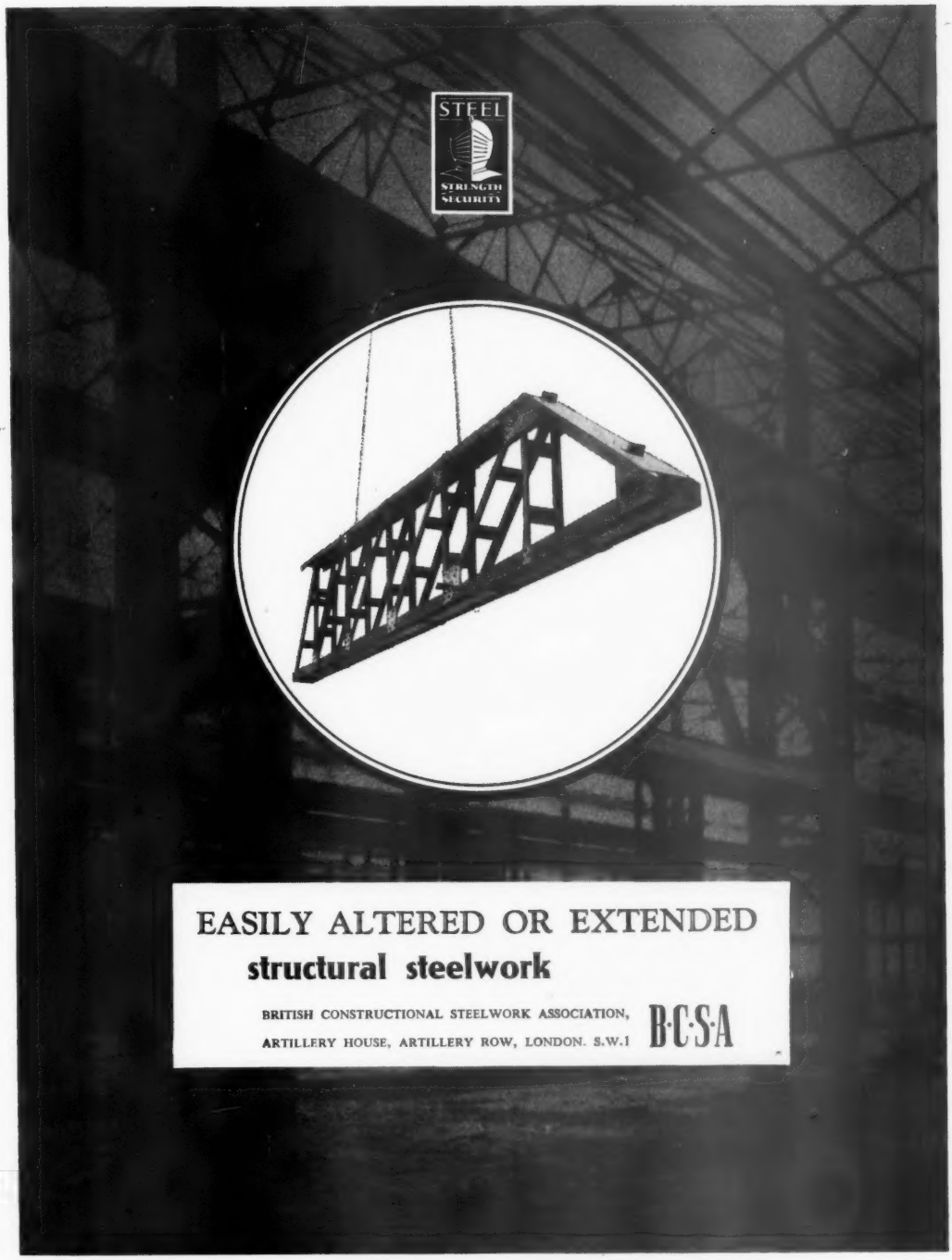
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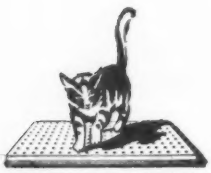

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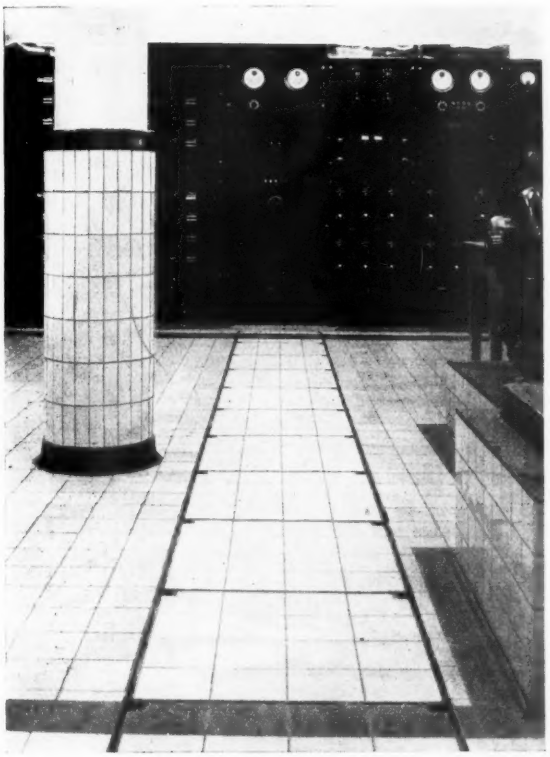

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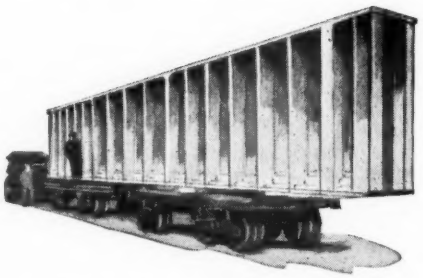

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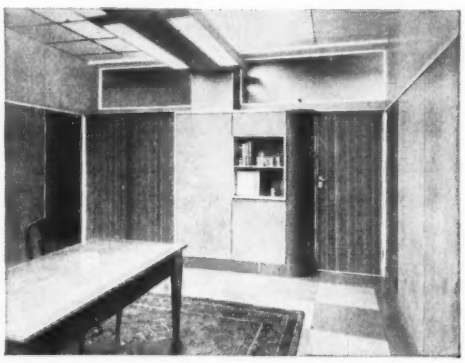

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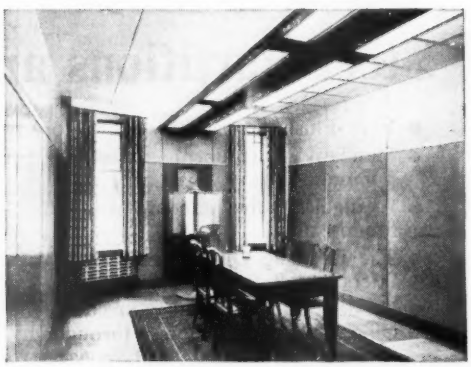

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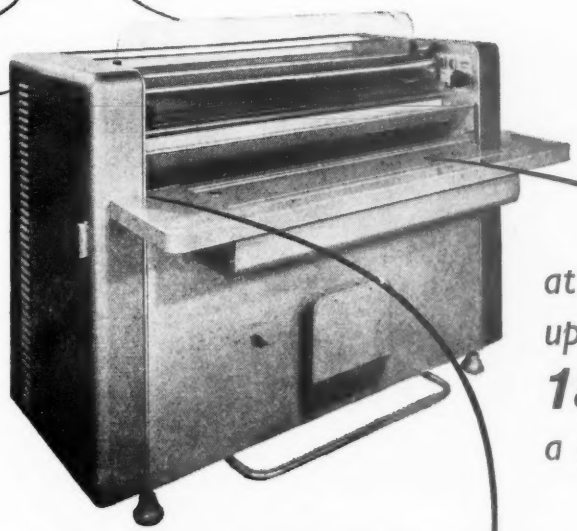

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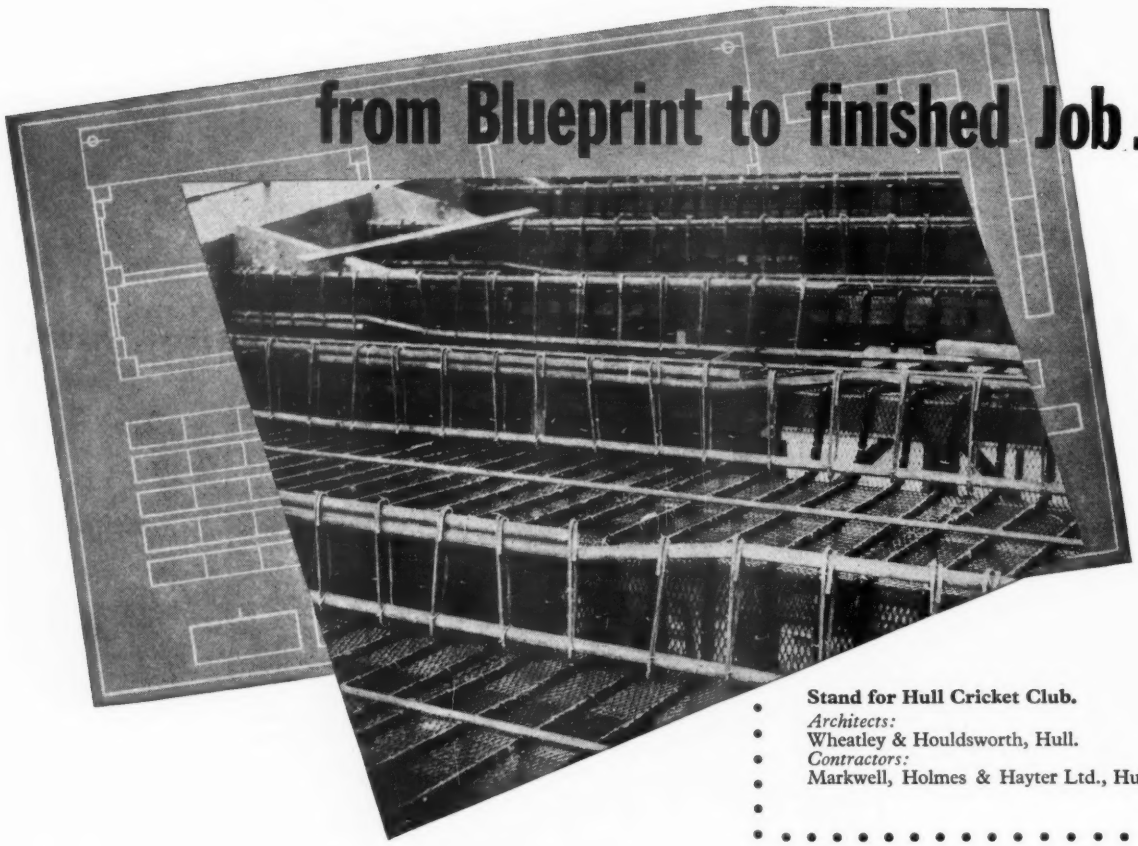

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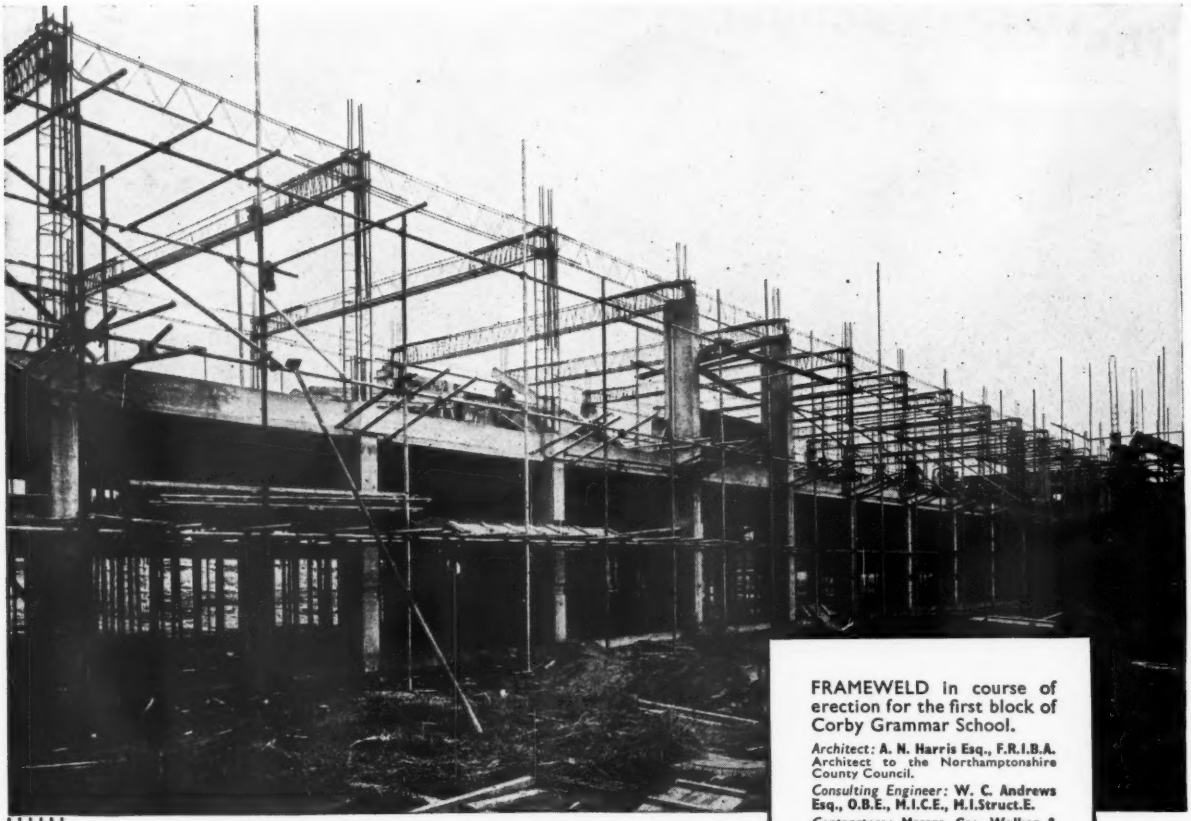

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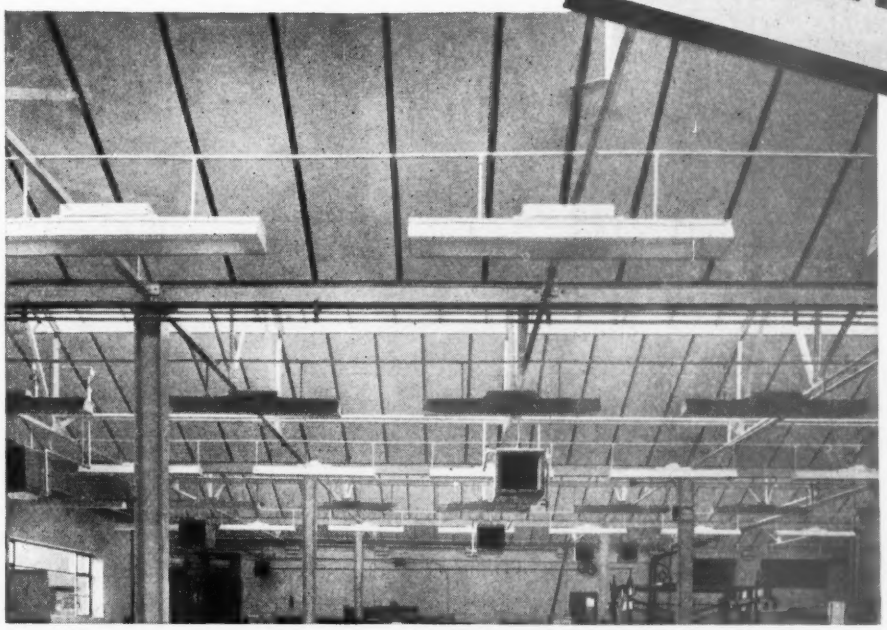

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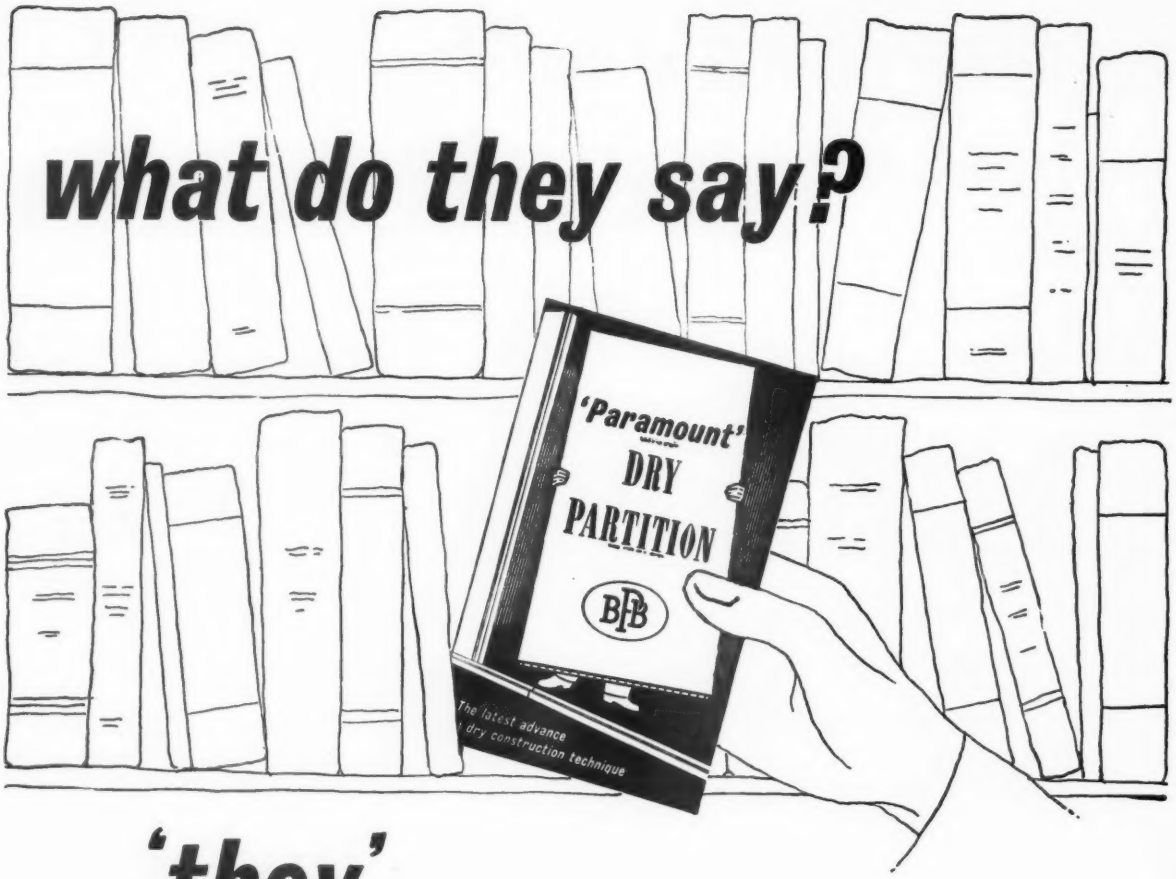

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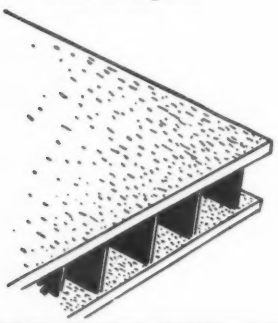

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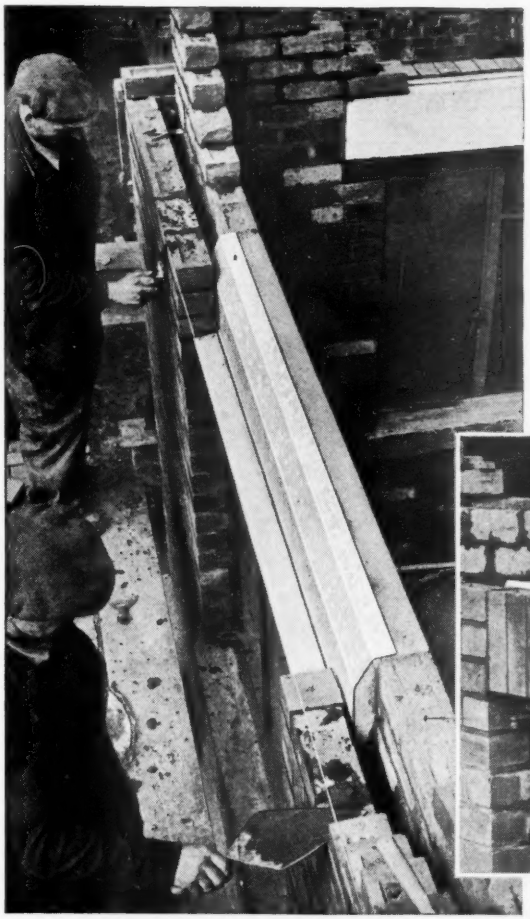

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(2) 6 in. Dorman Long Lintel (shown dotted)
(3) Outer skin
(4) Cavity
(5) Inner skin
(6) Inside concrete lintel (carried out into cavity if so desired)
(7) Flat arch

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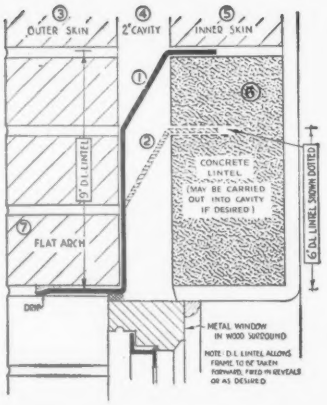
3 OUTER SKIN
4 2" CAVITY
5 INNER SKIN
1
6
2
9" D.L. LINTEL
CONCRETE LINTEL (MAY BE CARRIED OUT INTO CAVITY IF DESIRED)
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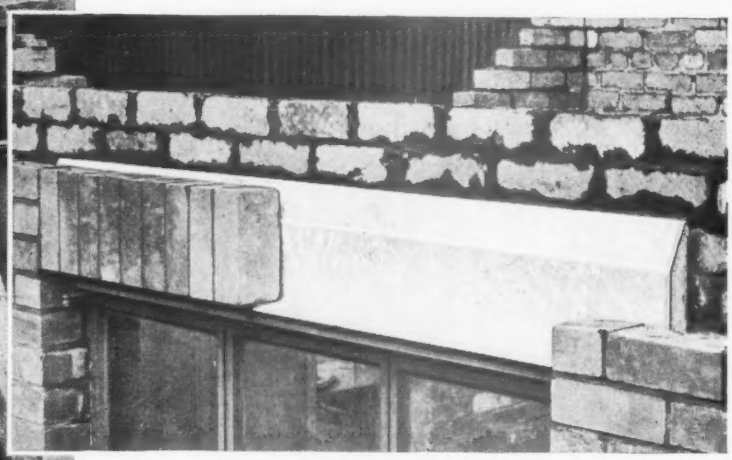

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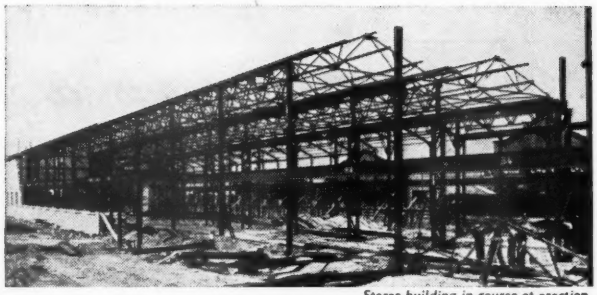

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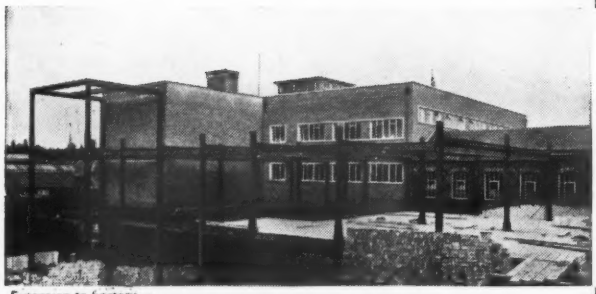

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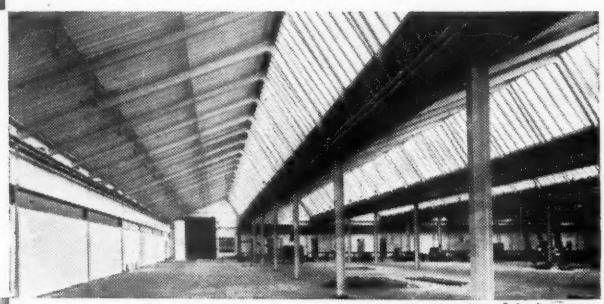

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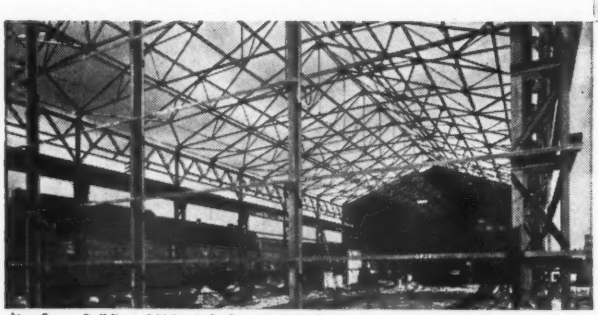

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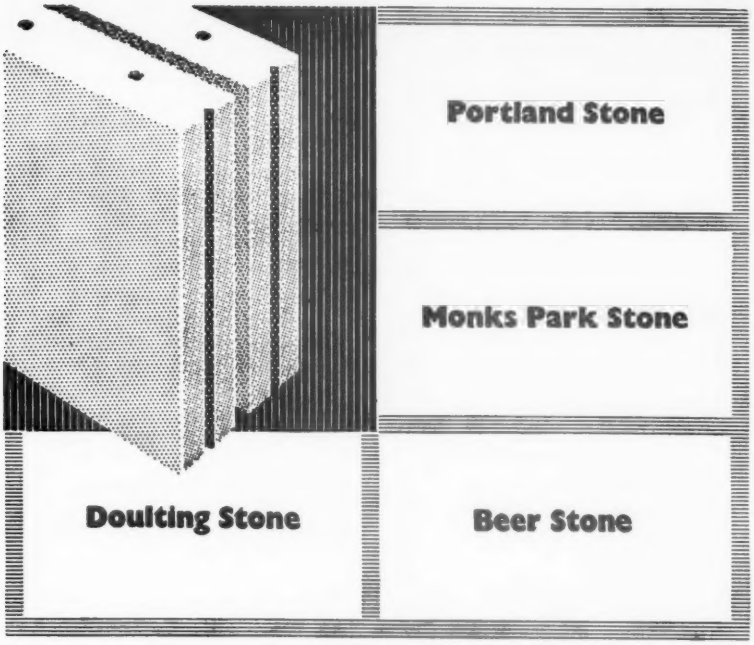

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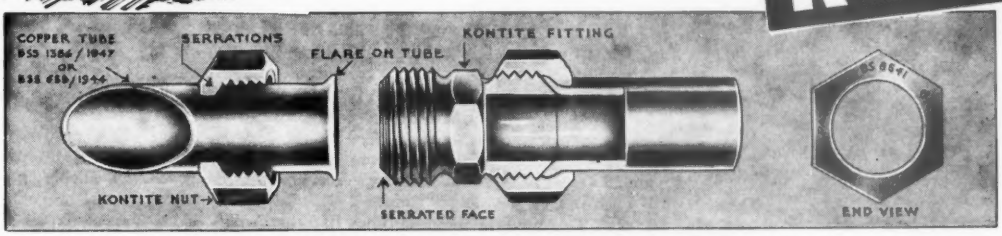

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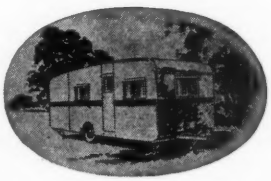

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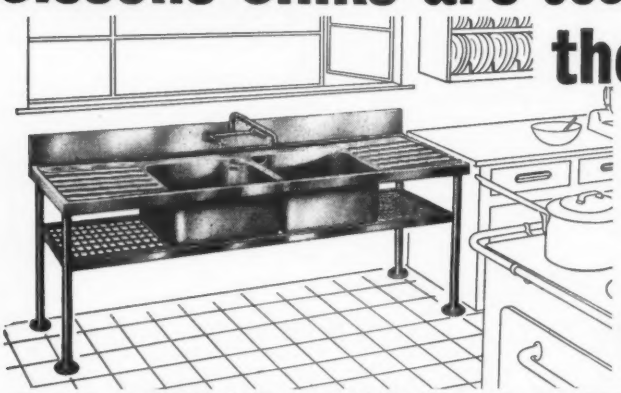

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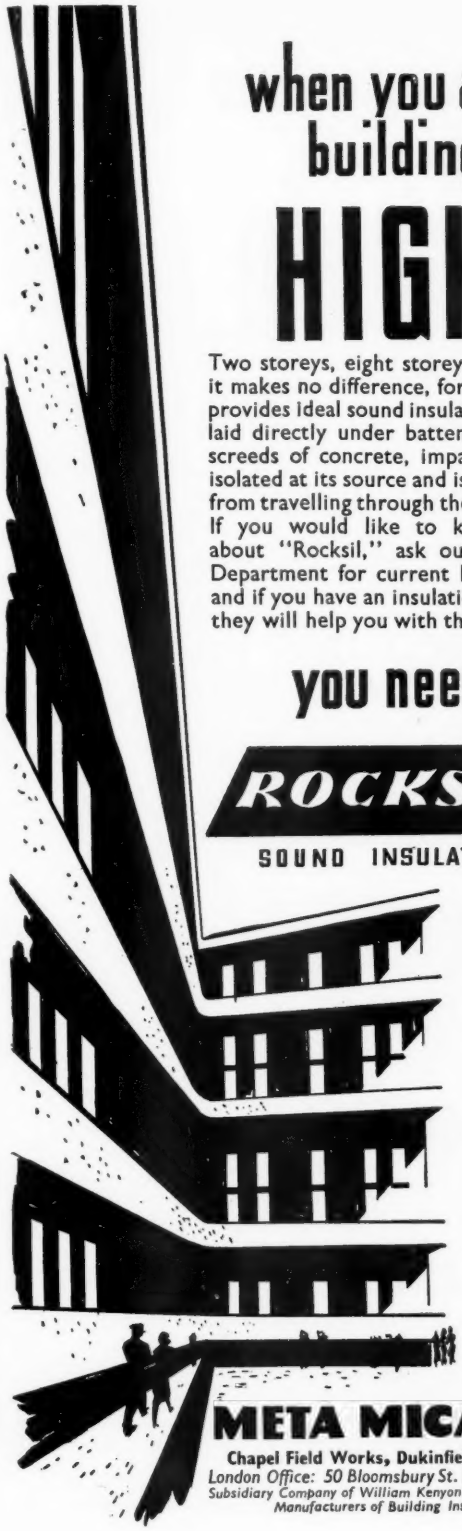

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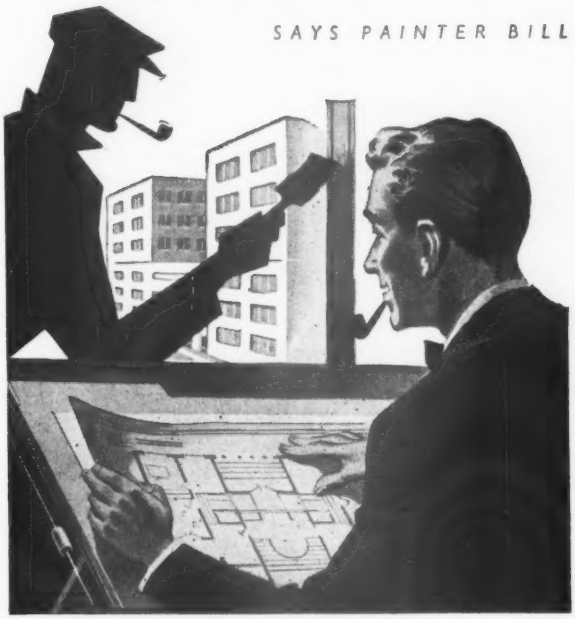

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Building Research Station Digest
No. 78
JUNE, 1955

Vibrations In Buildings

Introduction

In the past, fears have been expressed of damage to buildings by vibration caused, for example, by new developments in transport. For this reason the vibrations set up by the underground railways in London and, in the 1920's, by the heavy road vehicles then coming into increasing use, were investigated. These fears have not been realized; in fact, with comparatively few sources of vibration is there any risk of damage to normal buildings. On the other hand intensities that cause no structural damage may be found intolerable by human beings, who are extremely sensitive to vibration. From this human standpoint some of the problems of vibration are akin to those of excessive noise; other problems are interference with trade processes, delicate machinery or apparatus.

The use of faster and heavier machinery of all kinds and developments in air transport all tend to increase noise and vibration. Ground and structure vibrations investigated by the Building Research Station include those caused by forge hammers, compressors, moulding machines, vibrating tables, textile machinery, blasting, pile-driving, road traffic and piston-engined aircraft.

Terms used

Vibration is repeated movement about a position of rest, and many vibrations, particularly those produced by machinery, are of simple harmonic form, i.e. like that of a vibrating string. Specific terms are used to describe the extent of the movement, the number of times it is repeated in unit time, and the nature of the vibration, i.e. whether it is free or forced.

Amplitude(a) is the displacement from the position of rest (displacement from mean position). This displacement will often be predominantly vertical or horizontal; where this is not so, it can be resolved into vertical and horizontal components.

A cycle is made up of one complete sequence of repeated events.

Period (T), is the time taken, usually in a fraction of a second, for one complete cycle of movement.

Frequency (n), is the number of times the cycle is repeated in unit time and is usually stated as cycles per second (c.p.s.). It is therefore the inverse of the period; if, for example, the period were 0·1 second, the corresponding frequency would be 10 c.p.s.

Acceleration is the rate of change of velocity and may be expressed in terms of the acceleration *(g)* due to gravity, for example, 0·1 *g*. Its importance lies in its relation to the forces involved.

Free vibration takes place when an elastic body or system is disturbed from its position of rest by a force or impulse that then ceases to act, for example, when a weight resting on a spring is pushed down and released. The system is then said to vibrate freely and the vibration dies out in time. The frequency is called the "natural frequency" and depends on factors such as the dimensions and elastic properties.

There is a definite relationship between the natural frequency of vibration of a system and the deflection of the system under static loading. The relationship is of great use in determining suitable types of anti-vibration mountings for machinery and apparatus. If, for example, a spring mounting deflects statically 0·15 in. under the load of a machine, the natural frequency of the combined machine and mounting would be 8 c.p.s., i.e. if the machine were displaced slightly and then released it would oscillate on the mounting at 8 c.p.s. If the static deflection were four times the previous value, the natural frequency resulting would be halved, i.e. 4 c.p.s.

Forced vibration is produced in a body when it is affected by some external source of energy and under such conditions the body will vibrate at a frequency which is the same as that of the source of vibration. Therefore, although the fundamental, or natural, frequency of a given system is fixed, the system can be made to vibrate at frequencies other than this. Ground vibration is an example. The natural frequency of some types of ground is about 15 c.p.s., but if an electric motor operating at 3000 r.p.m., producing vibration frequency of 50 c.p.s., rests on the ground then the ground will transmit vibration having a frequency of 50 c.p.s. If on the other hand the ground received a blow it would vibrate at its natural frequency, e.g. 15 c.p.s.

The relationship between the forcing frequency and the natural frequency will determine the movement of the affected system. A special case arises when the frequencies are the same. Then

TABLE 1: HUMAN SENSITIVITY TO VERTICAL VIBRATION

	Frequency (c.p.s.)						Human sensation (The Reiher-Meister Scale)
	3	5	10	20	30	50	
Range of amplitude (thousandths of an inch)	0·7–2·0	0·4–1·1	0·2–0·6	0·1–0·3	0·07–0·19	0·04–0·1	Just perceptible
	2–6	1·1–3·2	0·6–1·6	0·3–0·8	0·19–0·52	0·1 –0·3	Clearly „
	6–30	3·2–16	1·6–5·0	0·8–1·8	0·52–0·90	0·3 –0·5	Annoying
	—	16–43	5–13	1·8–3·1	0·9–1·5	0·5 –0·6	Unpleasant
	—	>43	>13	>3·1	>1·5	>0·6	Painful (harmful to people even for short periods)

resonance will occur and large amplitudes and forces may be produced.

Human sensitivity to vibration

People are much more sensitive to vibration than is generally appreciated. An important investigation into human sensitivity was carried out in Germany in 1931, when a selected group of people were subjected to vibrations of known amplitude and frequency and their sensations noted. The results are summarized in Table 1 and in Fig. 1 and the frequencies and amplitudes should be compared with those measured in buildings (Table 2). It was found that the sensation depends on both frequency and amplitude. For example, at 20 c.p.s. an amplitude of ·003 in. causes painful sensations but at 50 c.p.s. an amplitude of only one-fifth of that amount creates the same sensation. The amplitudes are thus comparatively small. It was noted also that vertical vibration is most readily detected when people are standing, whereas horizontal vibration is more noticeable when they are lying down and particularly when they are at right angles to the direction of vibration.

Vibration and damage to buildings

The question of what constitutes a damaging vibration is not easy to answer with absolute certainty in all cases. There is no universally accepted criterion that may be used to compare the effects of vibrations of differing amplitudes and frequencies. Again, many factors are involved such as the additional stresses set up by the vibration, the possibility of resonance, the size of building, the type of construction, the fatigue properties of the materials, etc. A static stress analysis for a structure is often difficult enough; analysis of the dynamic stresses set up by vibration in a masonry structure is virtually impossible.

The criteria that assist in determining the effects of vibration include amplitude, acceleration, energy, and the use of the human sensitivity scales. A comparison with cases where no damage has been produced by vibration of known amplitude and frequency may often be useful.

Vibration caused by an earthquake is the most severe to which a building is likely to be exposed. Under such conditions large horizontal forces and movements may be involved, and there is also the possibility of resonance in taller structures. Well designed buildings are often not damaged even by a severe earthquake and much has been done in earthquake regions to improve design. It is not proposed to discuss the methods here.

From experience in earthquake regions, shocks of short duration producing amplitudes of less than 0·02 in. are not found to be injurious, and the critical amplitude may be very much greater than this. Work carried out in America indicates that conventional types of property, either wood-framed or of brick construction, can safely withstand amplitudes of about 0·016 in. These results form the basis of certain working rules used in blasting operations giving the maximum charges that may safely be fired at certain distances if a specified maximum amplitude is not to be exceeded, due allowance being made for the type of soil. These amplitudes range from 0·005 in. for churches and old buildings to 0·016 in. and more for quarry buildings. A similar procedure is used in this country and operates well in practice. Another suggestion is that the product of amplitude and frequency should not exceed a specified maximum value.

In Germany, a unit of measurement has been devised by means of which the intensities of vibration of differing amplitudes and frequencies may be compared. This unit enables an estimate to be made of the possible damaging effect of vibration, and has been verified in a few practical examples where damage was, or was not, caused by vibration of known amplitude and frequency.

Fig. 2 shows the "zones" of intensity according to this system, together with the possible damaging effect. In general, a vibration that would be deemed "unpleasant" by a human being would, according to this system, be classed as a strong vibration.

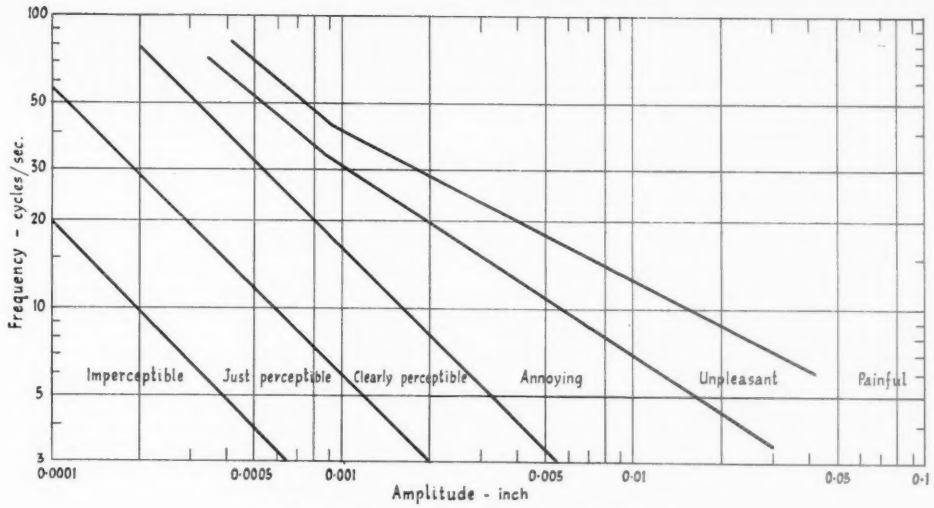

FIG. 1. HUMAN SENSITIVITY TO VIBRATION

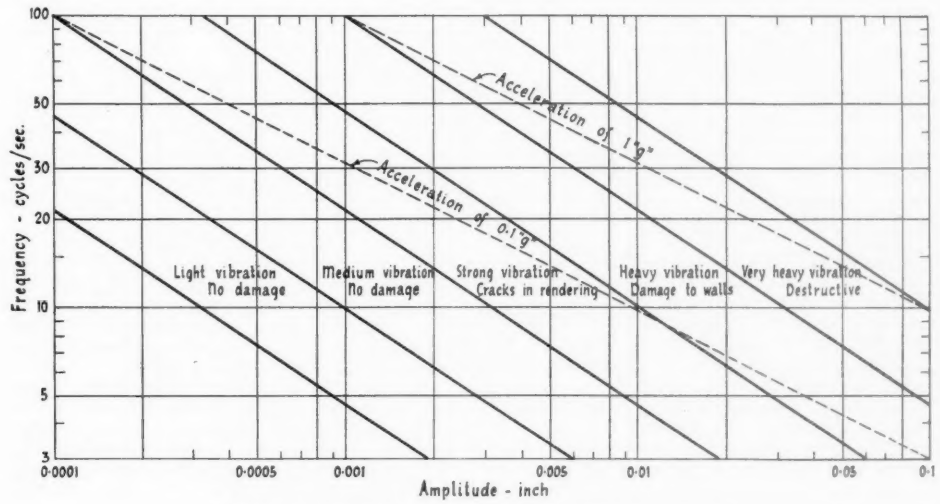

FIG. 2 VIBRATION INTENSITY AND POSSIBLE DAMAGE

Although the effects of vibration on a building cannot be estimated merely by knowing how great the vibration amplitude appears to a person in the building, nevertheless the results of the work on human sensitivity previously referred to may be of some guidance. In the majority of cases it may be assumed that the vibration must become "unpleasant" or "painful" to a person in a building long before there is any possibility of structural damage. This "human factor of safety" is acknowledged in the various scales of earthquake intensity, where it is common to find that a certain intensity of earth shock causes people to leave their homes in a fright and a very much larger intensity is required to produce minor damage. Cases where vibration has caused severe structural damage are but rarely encountered in this country.

The U.S. Bureau of Mines carried out a very comprehensive series of tests in which they deliberately attempted to cause damage to houses by explosions, or by mechanical agitation within the building. The results of these tests show that vibratory movements of the order of 0·1 in. are required to produce severe cracking of plaster, and failure did not necessarily occur when floors or ceilings were in a state of resonance. If it is accepted that amplitudes of this order are required to cause cracking it does not seem possible for plaster to be cracked by vibration of the intensities commonly experienced. Door-slamming or walking about in a house are likely to produce greater vibration than most external sources.

Nevertheless complaints are sometimes made that minor damage such as the cracking of plaster ceilings, or brickwork and glass, and the loosening of tiles has been caused by vibration. It must be remembered that there are many causes of cracking in buildings* and until the possibility that these have been operative has been excluded, the cracks cannot be attributed to the effects of vibration. For example much of the cracking in plaster ceilings must be attributed to movements of the plastering itself or of the timber supports due to changes in moisture content and the frequency with which plaster cracks even in areas known to be free from external sources of vibration clearly confirms that either the movements of the structure or internal vibration have been the main factors. Cracks in buildings often pass unnoticed for a long time and not until mention is made of the possibility of damage by vibration is attention drawn to them.

Widespread attention is being drawn in other fields of engineering to the effect of fatigue in vibrating structures but in building vibration problems there is no evidence that fatigue is significant.

* See, for example, National Building Study, Bulletin No. 9: "Some common defects in brickwork"

THE ISOLATION AND REDUCTION OF VIBRATION

Vibration can usually be isolated or reduced by fairly simple and relatively inexpensive means if the precautions are incorporated in the initial design. It is often difficult and expensive to provide a remedy in existing buildings and installations.

The ways in which the nuisance from vibrations can be avoided or at least reduced to a tolerable level include the reduction of the vibration at the source, the reduction of the vibrations transmitted to the immediate surroundings of the source, placing machines that cause vibration as far as possible from people and equipment likely to be affected, reducing the amount of vibration transmitted to sensitive apparatus and isolating a complete building or part of it from external vibrations.

Reducing vibration at source

This can be done by the maker of the machine by dynamic balancing of the moving parts so far as this is possible; an alteration in the speed of the machine may be effective in some cases.

Reducing vibration transmitted from machines

Various methods may be used to reduce the transmission of vibration from machines. One is to put the machine on a heavy block, of weight comparable to that of the machine, resting directly on the ground; the vibrations are then reduced by the increase in mass. A development of this is to place the foundation block in a pit with a layer of suitable insulation material either under the block or between the block and the machine. An air-gap should be left all round the block but the gaps may be covered at the top by a strip of *flexible* material to prevent the ingress of debris. Satisfactory results may also be achieved by placing a mounting between the base of the machine and a slab of concrete resting on the ground. The latter method avoids the need for foundation block and pit, is obviously more convenient and less expensive and is particularly suitable for low and medium power machines that are not likely to generate very low frequency vibrations. The choice of insulating material is a matter for specialist advice but it may be of cork, felt, rubber or composite materials; steel springs are sometimes used. Each material has its advantages and disadvantages for any given conditions. Some firms deal only with a particular material or type of unit but others will advise on the type most suitable for a given installation.

In many cases a compromise solution may have to be accepted. Bolting a machine tightly to a foundation block may prevent vibration of the machine itself but harmful vibrations may thereby be transmitted elsewhere because the disturbing forces remain virtually undiminished. On the other hand, a very flexible mounting, while it may greatly reduce the transmitted vibration, may

TABLE 2: RESULTS OF SOME INVESTIGATIONS MADE BY THE BUILDING RESEARCH STATION 1947–55

Source of vibration	Distance (feet)	Amplitude (thousandths of an inch)		Frequency (c.p.s.)	Notes
		Vertical	Horizontal		
Aircraft (piston engines)	—	0·14	—	various	Vibration of upper floor of house. Aircraft overhead
Bell ringing	—	0·06	1·94	4–30	Measurements in tower beneath bells. Low frequency horizontal vibration.
Centrifuge	—	0·10	—	13	Measurements in a laboratory.
Compressor	*near source*	9·4	0·22	7	In compressor house.
Compressor	200	0·56	2·4	7	Vibration in a house.
Drilling operations	10	1·2	0·43	12	Close to drill.
Drilling operations	160	0·05	0·07	12	Ground vibration.
Drilling operations	360	0·02	—	12	Near a house.
Drop stamps	20	7·0	—	10–15	3–5 ton stamps. Measurement in works.
Drop stamps	55	2·08	—	10–15	3–5 ton stamps. Just outside works.
Drop stamps	190	0·76	—	10–15	3–5 ton stamps. Measurement in bedroom of nearby house.
Drop stamps	325	1·85	0·40	6–14	18 ton "Massey" hammer. Measurements in works area.
Drop stamps	480	0·78	0·28	6–14	18 ton "Massey" hammer. Measurements in works area.
Electric trains	—	0·40	0·05	10	Ground vibration.
Fatigue machine	8	0·22	—	32	Vibration of concrete floor.
Gunfire	great	0·09	0·17	11–23	Vibration of church tower. Horizontal vibration of low frequency.
Gunfire	100	1·18	0·27	20	Ground vibration.
Gunfire	52	5·6	3·3	10	Vibration in nearby office.
Gunfire	190	1·08	0·73	10	Measurement on concrete floor of workshop.
Impact testing m/c.	16	2·2	—	20–25	Large capacity machine. Concrete floor vibration.
Knitting machines	2	1·25	—	30–35	Near machine base.
Knitting machines	20	0·11	—	30–35	Just outside the knitting bay.
Motor mower	5	0·10	—	22	Concrete floor vibration.
Moulding machines	50	0·18	—	25	Vibration of wood floor in nearby house.
Pile driving	90	0·60	0·23	10–15	Measurement in roadway.
Pile driving	160	0·55	—	8–10	Vibration of concrete floor in works.
Pile driving	460	0·08	—	8–10	Vibration of concrete floor in works.
Pneumatic pumps	—	0·72	1·35	—	Vibration at 5th floor level. Low frequency vibration.
Press	6	1·17	—	10–20	Vibration of concrete floor.
Printing works	—	0·04	0·09	22	Vibration recorded in adjacent laboratory.
Rotary furnace	100	0·17	—	23	Measurements on wood floor of bedroom.
Smelting works plant	*near source*	3·95	—	8	Vibration of concrete floor of works.
	130	0·50	—	8	Vibration of concrete floor of works.
Road traffic	20	0·31	0·06	15–60	Measurements on pavement.
Road traffic	—	0·14	0·06	17–25	Measurements in building close to main road.
Underground railway	—	0·20	—	10–30	Measurements in basement of a building.
Person walking on floor of house	—	5·6	—	10–20	Vibration of bedroom floor.

result in a large increase in amplitude of movement of the machine itself which may be inconvenient to the operator, or even harmful to the machine. In most cases, however, a satisfactory result is achieved when the natural frequency of the spring-supported mass is made to be about one-third of the forcing frequency, the latter depending on the rate of operation of the machine. If the required natural frequency can be determined the required static deflection can be found in most cases and, from this, the stiffness of the spring or mounting. For a frequency ratio of 3 to 1 as suggested the transmitted vibration amplitude would, theoretically, be reduced by about 80 per cent.

The relationships given in Table 1 between human sensitivity and the amplitudes and frequencies of vibrations can be used in choosing a suitable mounting. If a machine is producing vibrations that constitute some degree of nuisance in the vicinity, the values in the table would indicate by how much the amplitude should be reduced to bring the vibration down to a tolerable level and from this a suitable mounting could be selected. For example, if the machine was producing vertical amplitudes in nearby property of 0·0006 in. at a frequency of 30 c.p.s. the vibration intensity would be deemed "annoying". If the machine were then fitted with a "10 cycle mounting", for which the required static deflection under load would be about 0·1 in. the amplitude would, theoretically, be reduced to about 0·0001 in. or less and the vibration would then be "just perceptible".

Makeshift remedies such as placing a pad of some sort under the machine are all too often useless, generally because the mounting is too stiff and the low frequency structural vibrations have been virtually unchanged.

Siting of machinery

The amplitude of vibration reduces with distance from the source, the rate of reduction depending on the type of ground. It is not possible to give any precise values for the rates. All that can be said is that machinery or plant causing vibrations should be kept as far away as possible from buildings likely to be affected.

Reducing vibration transmitted to apparatus

Sometimes a certain level of vibration has to be accepted either because the source of vibration is outside the control of the persons affected or because it is not possible entirely to eliminate the vibration. It may not be sufficient to cause annoyance but may affect sensitive instruments. People walking about in a room, particularly if the floor is a suspended timber floor, may sometimes be sufficient to cause trouble. In such cases some method of isolating individual pieces of apparatus is needed.

One method is to build an isolated pier upon which the apparatus may stand. Such piers may be about a foot or so square and are usually built of brick, concrete or stone and pass through the floor into the foundation or basement of the building. Such piers are particularly useful for supporting optical apparatus, galvanometers, balances, etc., but the greatest care should be taken to ensure that, in passing into the foundation, they do not pick up vibrations from other sources. If there is any possibility of this occurring, some anti-vibration material should be incorporated into the pier, or interposed between instrument and pier. As a general rule, where delicate work has to be carried out in upper storeys with wood floors, the apparatus should be kept away from the centre of the floor. The best position may be near the walls, but it is probably desirable that benches supporting delicate equipment should avoid direct contact with walls, otherwise vibration may be picked up through the shell of the building.

In place of, or in addition to, the general method of isolation referred to, apparatus and equipment may also be protected against vibration by using special instrument mountings; these are usually of rubber and are similar to some types used for mounting machinery but are of smaller size and load capacity. They are available in a variety of shapes and sizes, and a suitable mounting can usually be selected, dependent on the frequency of the vibration which is affecting the instrument and on the weight to be supported. Special mountings are also available for the isolation of racks of electronic and electrical equipment, and these have been particularly developed for use in aircraft. At least one firm markets a special anti-vibration mounting for chemical balances. It should be noted that some types of laboratory apparatus may be affected by amplitudes of a few millionths of an inch, and a very high degree of isolation is then needed.

The isolation of buildings

The isolation of a complete building, or of part of a structure, is a more difficult matter and in many cases the work required would be too elaborate or too costly to be practicable. Comparatively few attempts have been made to isolate a building, and these have not always been successful. Sometimes the treatment has resulted only in a reduction in the higher frequency vibrations.

Various proprietary composition materials have been used under girders and columns, and composite pads of lead and asbestos have been used as vibration mats under column footings in certain installations in the United States, including the Grand Central Station, New York. Where vibration mats or pads are used for structural purposes they will often be subjected to high loading, and if over-compressed their efficiency may well be impaired.

Trenches have also been used as a means of preventing external vibrations affecting a building. Although such treatment may be effective on a small scale, it is very doubtful if it provides a satisfactory solution for a large building, particularly if the vibrations are deep seated rather than close to the surface. Experiments in connection with vibrations from pile driving for instance have shown that the presence of a pit 7 ft deep and 13 ft 6 in. wide, made between the source of vibration and the recording instrument, did not appreciably reduce the vibrations. Seismological observation posts on the other hand have been successfully protected against vibration from traffic and near-by trains by surrounding the piers, upon which the recorders rested, by trenches about 4 ft deep. In Germany a building was designed to have an "air-gap" all round, between the retaining walls and the main structure to protect the building from vibration caused by passing traffic. The "floating-floor" technique, which has been used successfully in dealing with sound transmission problems, may have possible value also in reducing structure-borne vibrations from small rooms, but it would probably be effective only against the higher frequency vibrations. Thus, at the moment, there does not appear to be any effective, yet inexpensive, means of isolating a complete building from vibrations of comparatively low frequency. Occasionally it may be possible to isolate completely one part of a building containing the source of vibration from the remainder but except in extreme cases it is best to deal with the problem at source.

(Prepared by the Building Research Station, Garston, Watford, Herts)

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MATTHEW HALL & CO., LTD.

The Twenty-eighth Annual General Meeting of Matthew Hall & Co., Limited, was held on 25th May, 1955, at Matthew Hall House, Dorset Square, London.

The following is the circulated statement of the Chairman, Mr. Bertram Baden, M.C., S.B.St.J., M.I.H.V.E.:—

I am happy to report another successful year.

The Group Profit on Trading in 1954 was £360,774 (1953 £208,764) and after deducting Directors' Remuneration, Depreciation and Provision for Deferred Repairs, there remains a Net Profit before taxation of £286,034 (1953 £133,662).

Partly because your Board is considering the inauguration of a superannuation scheme for established staff they have, on this occasion, placed £41,000 to General Reserve (1953 £20,000). It is recommended that a dividend of 30% (1953 22½%) be paid, leaving £225,279 (1953 £122,868) to be carried forward in the Group's Accounts.

The Directors also recommend that £60,000 of the Company's reserves be capitalised and applied in paying up in full 240,000 new Ordinary Shares of 5/- each to be issued to members in the proportion of one new share for every two shares already held.

Self-financing Contracts have again been generally predominant both here and abroad, resulting in a further increase of our liquid resources.

The Company continues to play an important part in the fields of air-conditioning, heating, electrical and sanitation and undertakes contracts combining all of these services. An increasing number of clients make use of the facility of placing all mechanical services with one contractor, which they find makes for economy, speed and convenience.

Our chemical, oil refinery and industrial engineering projects, which include design, procurement and erection, have increased.

State Hospital, Doha, Qatar. Air Conditioning

Air-Conditioning Division.—Among air-conditioning contracts secured during the year were the American owned Westbury Hotel in New Bond Street, a large office block at Holborn Viaduct, laboratories and air conditioning for various industrial processes.

Contracts overseas include fully air-conditioned hospitals in Aden and Qatar and a film centre in Ceylon.

Electrical.—Industrial work included instrumentation and lighting and power for chemical and oil refinery plants.

During the year we completed services to two thousand Reema houses.

Installations overseas included generating plants and ancillaries for power stations, and offices and workshops in West Africa and Iraq.

Chemical, Oil Refinery and Industrial Engineering Division.—We have been increasingly engaged on the design, procurement, construction and commissioning of process plants including de-gassing columns, a batch distillation unit employing induction heating, double effect evaporators and sulphur melting plant.

Other work included erection of sulphuric acid, catalyst production, and benzole distillation plants, also rotary kilns each 284 feet long. In our factories, we manufactured skid mounted gas separating stations for Venezuela.

A section of one of our drawing offices

Our drawing offices are among the largest and best equipped in the country.

Atomic Work.—This country has taken a lead in the development of atomic energy for industrial purposes and we are proud that we have been engaged on engineering work on all the major atomic research establishments in the country, including Britain's first atomic electricity generating station.

Plumbing and Garchey.—Among our plumbing contracts in London is the Bank of England's premises at St. Paul's Precincts. During the year, we completed plumbing services to some thousands of houses.

The Garchey system of refuse disposal was completed on a large block of flats in Newcastle, also one at Birmingham where a further installation is in hand.

Matthew Hall (Pty.) Ltd., South Africa.—During the year, this Company doubled its turnover despite keener competition.

For the mines and the uranium industry, we have manufactured and installed miles of piping, up to 30 ins. in diameter—the Free State mines alone used over 40 miles.

The Chemical Division has carried out chemical leadwork for sulphuric acid plants, leadlining of absorption towers for an auto-oxidisation plant and lead acid transfer piping for a pyrites recovery plant.

Other contracts included work on uranium oxide extraction and concentrate plants, fume removal, scrubbers and building pressurisation for a tungstic acid plant.

The Automatic Sprinkler Division carried out installations in all four Provinces of the Union in departmental stores, offices, factories and warehouses.

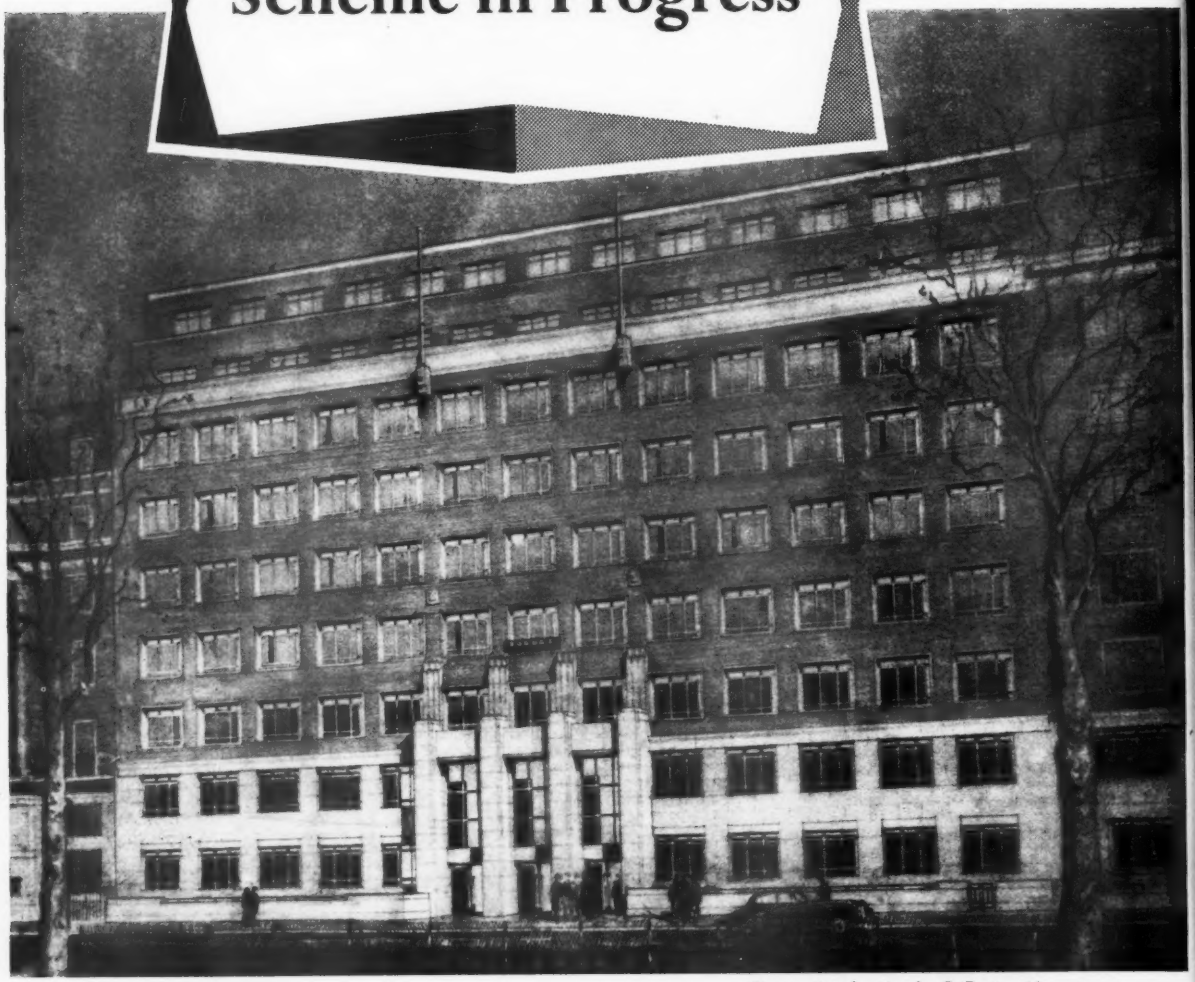
Federation of Central Africa.—Our Rhodesian Branches have extended their activities and orders cover air conditioning, sanitation and automatic sprinklers to hotels, flats, offices, factories, schools, hospitals and a research station.

The leadburning contracts at the copper mines continue.

This review would not be complete without reference to the capable and enthusiastic way in which our large staff and other employees at home and overseas have fulfilled their duties, and it gives me pleasure to express to them the most sincere thanks of the Board.

The report and accounts were adopted.

Scheme in Progress



Perspective drawing by R.C. Arnold F.R.I.B.A.

Office Building Tavistock Square, London

This nine storey office block has a floor area of 122,600 feet super. The front elevation is Portland stone at basement, ground and first floor levels and the impressive main entrance features three large doors and four piers rising to the third floor with spacious entrance hall which is open to the second floor.

Architect: Hector O. Hamilton, F.R.I.B.A. *Executant Architect: R. C. Arnold,* F.R.I.B.A.

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